The JOURNAL OF ELECTRICITY POWER AND GAS

WITH WHICH IS INCORPORATED
The Engineers' Architects' and Builders' News

PUBLISHED WEEKLY

BY THE TECHNICAL PUBLISHING COMPANY, ATLAS BUILDING, 604 MISSION STREET, SAN FRANCISCO CAL.
Entered as second-class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the Act of Congress March 3, 1879.

VOL. XIX. No. 16 SAN FRANCISCO, CAL., October 19, 1907. Yearly subscription $2.50 Single copies 10 cents Back numbers prior to current month 25 cents.

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THE

Journal of Electricity, Power and Gas

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The Engineers', Architects' and Builders' News

VOLUME XIX. SAN FRANCISCO, CAL., OCTOBER 19, 1907 No. 16

MODERN EUROPEAN AND AMERICAN STEAM TURBINES.

It must be acknowledged that the development of the steam turbine in large units during the past two or three years has been most wonderful. In Germany, France and England, as well as in America, very large units are being constructed, and even greater sizes are contemplated with normal capacities of 10,000 kilowatts, capable of caring for peaks of loads up to 20,000 kilowatts without difficulty.

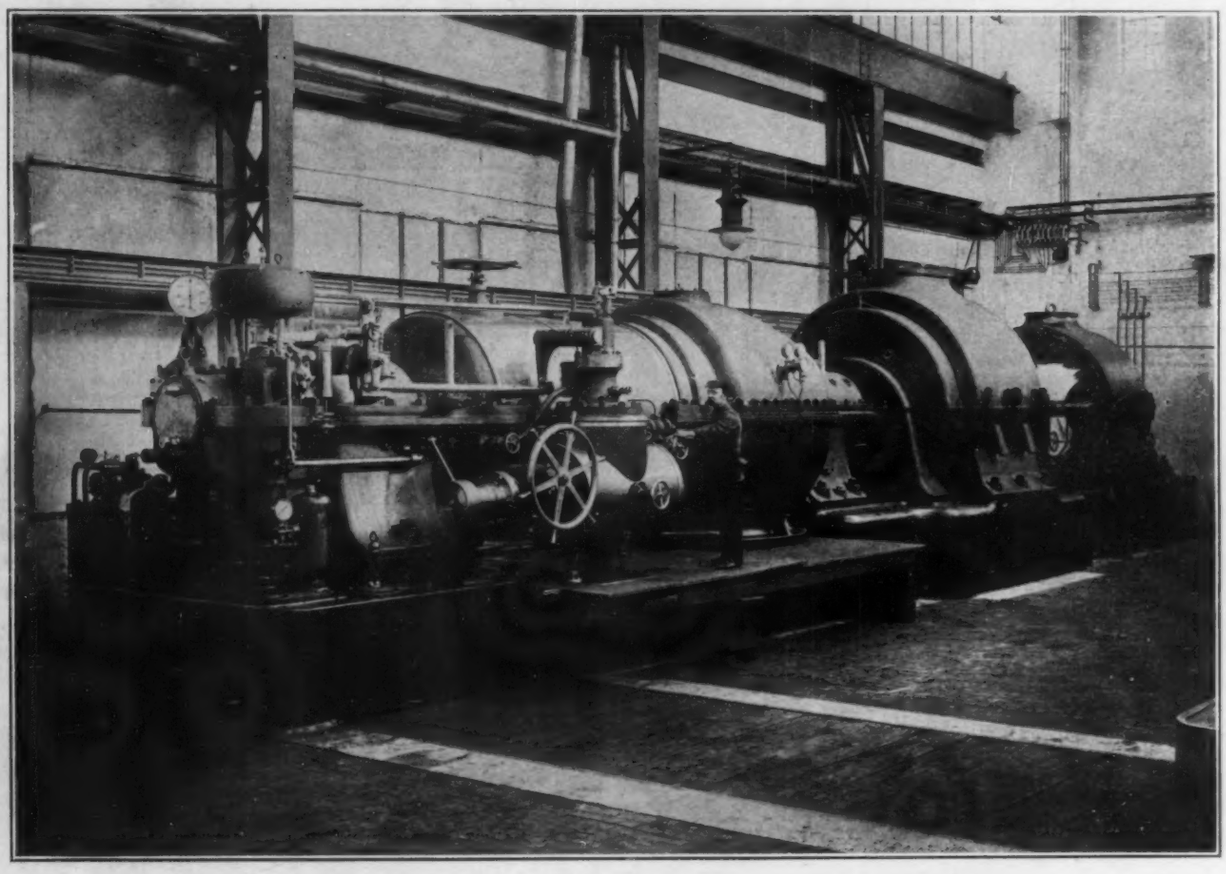


FIG. 1. 10,000 H. P. STEAM TURBINE DIRECT CONNECTED TO 5,000 K. W. GENERATOR.

Several central power stations are under consideration for London, each to contain a number of units of the size last mentioned, direct connected to alternators supplying polyphase current at a pressure of 12,000 volts. Unless the durability of the steam turbine blades under normal conditions was good, and unless the efficiency and reliability of the steam turbine had been demonstrated beyond question, it would seem foolhardy to attempt the installation of such power plants. The confidence of the steam turbine engineers in constructing units of these sizes, and the failure of engineers favoring the reciprocating steam engine to bring forth proof of the failure of the steam turbine, or an abnormal wear of the turbine blades, have done a great deal toward convincing the public of the merits of the steam turbine.

It may be of interest to consider some details of large steam turbines constructed and under process of construction in Europe.

The accompanying illustration, Fig. 1, shows a 10,000

horse-power steam turbine installed at Essen, Germany, which is directly coupled to a Drehstrom generator of 5,000 kilowatts capacity, and a direct current generator having an output of 1,500 kilowatts. This steam turbine is of the Brown-Boveri-Parsons type and operates at a speed of 1,000 revolutions per minute. The length of the steam turbine is 9.4 meters, while its total height is 2.6 meters, and it weights, complete, 107,000 kilograms. The total length of the complete unit including the steam turbine, three phase generator, continuous current dynamos, and exciter, all of which are directly coupled on the same shaft, is 20 meters, and the total weight of the unit is 190,000 kilograms.

This steam turbine was installed at the electric station at Essen-Ruhr, Germany, of the Rheinisch-Westfalischen Electricity Works, Ltd., and drives the direct current generator and the alternator at a speed of 1,000 revolutions per minute, the former supplying a continuous current at a pressure of 600 volts, absorbing 2,250 horse power, and the latter generating a three-phase current of 5,000 volts pressure with a frequency of 50 cycles, requiring 7,500 horse-power from the steam turbine. Another unit of the same capacity and construction is being built for the same station at Baden, Switzerland.

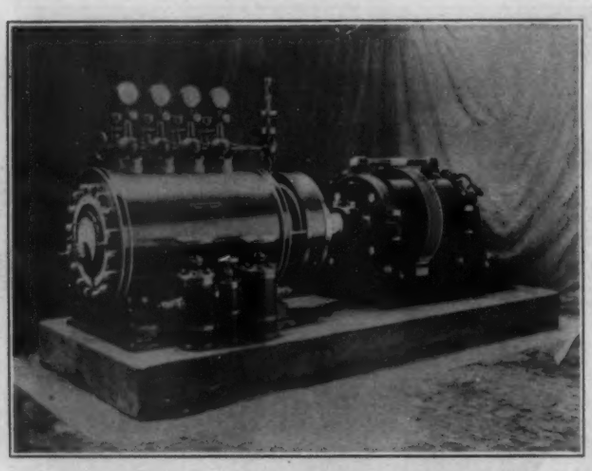


FIG. 2. PATSCHE ELECTRO-ROTARY COMPOUND ENGINE

One of the remarkable features of power station construction brought out before the London Power Bills Committee was the great reduction of first cost of power plants, utilizing high power steam turbines and alternators. The Hon. J. D. Fitzgerald, representing the Administrative County London and District Electric Power Company, explained that the average cost of a London power house with reciprocating engines was £51 per kilowatt, while his company could equip a power house at £9 per kilowatt. He also stated that the turbines would take two pounds of coal per kilowatt hour, while the existing reciprocating engines took four pounds, and other expenses would be reduced on a similar scale.

This power company proposed a maximum rate for power users of three cents per kilowatt, and it was stated before the London Power Bills Committee that in case a consumer required electricity for power purposes for eight hours out of the twenty-four, the price to him would be .865 d. per unit, or about 1.73 cents per kilowatt.

The plan for this great London power transmission system was to generate the power by the use of enormous steam turbines at three stations on the Thames River, where condensing water will be available to operate the turbines under best conditions of highest vacuum without the necessity of using cooling tower.

It was intended that the alternators should supply a three-phase current to a ring system of transmission encircling the city of London at a pressure of 12,000 volts, sub-stations being provided at various points for lowering the voltage and for distribution service. It is the idea of the promoters to so lower the cost of generation that the current can be sold to existing distributing companies at a profit, and yet at a lower figure than they can hope to generate themselves.

On the continent of Europe a great deal of attention has recently been paid to the rotary steam engine as well as to the steam turbine, and the progress in this line of work has been equally as great as in England and America. It may be of interest to consider some of the recent developments of this class of prime mover in France and Germany.

The accompanying illustration, Fig. 2, shows a new electro-rotations-Verbund Dampfmashine as designed by A.

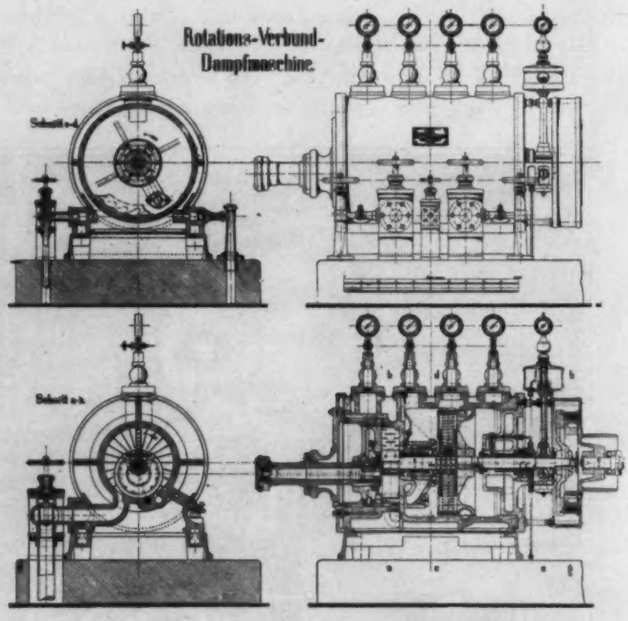


FIG. 3. PATSCHE ROTARY COMPOUND ENGINE

Patschke. This compound rotary steam engine and electrical generator are directly coupled together and operate at a speed of from 500 to 750 revolutions per minute. This outfit has a capacity of from 24 to 36 horse-power, and was constructed at Mulheim a. d. Ruhr, Germany, by H. Wilhelmi, who claims to be in a position to construct these rotary engines up to 6,000 horse-power capacity, the mechanical efficiency being, it is claimed, from 70 to 80 per cent.

The accompanying drawing, Fig. 3, shows the construction of this rotary compound steam engine and method of operation.

At Karlsruhe, Baden, the Elektra-Dampf-Turbine is being constructed for pumping purposes as well as for the operation of electrical generators by the Gesellschaft Fur Elektrische Industrie. These steam turbines are constructed for an output of from 10 to 100 horse-power. The 10 horse-power turbine operates at a speed of 4,000 revolutions per minute; that of 50 horse-power capacity, 3,000 revolutions per minute, while the 100 horse-power outfit has a speed of 2,500 revolutions per minute. The wheels of the 10 horse-power turbine measure 250 mm. in diameter and

have 200 vanes, the speed being 52 meters per second. The steam consumption is said to be 22 kilograms per hour per effective horse-power for this size, while the steam consumption with the 50 horse-power turbine with condensation is said to be 12 kilograms per effective horse-power per hour. This turbine has a wheel of 525 mm. diameter and 390 vanes, the speed being 82 meters per second.

Another German steam turbine which is making great headway and is constructed in both vertical and horizontal types is the Riedler-Stumpf steam turbine, constructed by the Allgemeine Elektrizitats-Gesellschaft of Berlin.

All these different machines are fitted with ejector condensers.

"A machine of 2,000 kilowatts at 1,500 revolutions per minute would have a turbine efficiency of 68 per cent, which would enable the following guarantee to be given, assuming the use of superheated steam and the condenser giving a very good vacuum, which it is easy to obtain with steam turbine in which there is no entrance for the air:

Pressure of steam on admission to turbine..200 lbs.
Vacuum in the condenser.....29 inches
Temperature of the steam.....350 degrees
Consumption of steam per horse-power-hour upon the shaft of turbine.....8.5 lbs.

This is a far better result, we believe, than can be given by reciprocating engines, and this can be obtained with steam turbines under the conditions specified."

These types of turbines are constructed with the idea of reducing the number of revolutions as much as possible with economical utilization of steam. They are built on the principle of the Delaval turbine, with wheels of very much larger diameter, as shown in the accompanying drawing, Fig. 4. In this way the necessary high peripheral velocity is attained without the very high speed otherwise required. The revolving wheels are built of nickel-steel discs with a high factor of safety, the wheels being balanced so that the center of gravity is exactly at the center of rotation. The blades or vanes are milled in the rim of the steel wheel and the bearings are placed close to the disc. The blades or vanes are built in pairs somewhat similar to the buckets or pockets of the Pelton water wheel. The 2,000 horse-power Riedler-Stumpf turbines noted in the drawing above mentioned, are constructed with the electrical generator placed between the two wheels, and are of the horizontal type. A 2,000 horse-power turbine of this type is in operation at the Moabit Electric Supply Station, the steam pressure being 200 pounds per square inch absolute, with a temperature of 294 degrees C and a vacuum of 85 per cent of absolute in the condenser. The dynamo is directly coupled to the wheel of the turbine, which weighs 850 kilograms, and the mechanical efficiency is high. In some of the Riedler-Stumpf turbines the kinetic energy of the steam is utilized in several wheels in succession instead of in one row of blades. A part of the energy only is used for the first wheel, the angles of the vanes being properly designed at the points of outlet and inlet so that the steam is guided to a second moving wheel where a part of its energy is given up, and then passed on to a third wheel in a similar manner. There is a limit to the number of velocity stages which can be utilized with economy, as a friction of the steam would be too great were an excessive number employed.

The Riedler-Stumpf turbines are designed with centrifugal jet-condensers attached to the turbine shaft, and the steam enters through an annular channel from the last moving wheel to the condenser wheel and mixes with the cold water coming in through a pipe provided for the purpose, while the mixture flows off through another pipe. This centrifugal jet-condenser is said to be applicable to the horizontal construction as well as to the vertical.

A test of these turbines at the Berlin Electric Supply Station showed a steam consumption of 20.3 pounds per kilowatt hour, with the turbo-generator operating at half load with 850 kilowatt output and a steam pressure of 116 pounds per square inch, the speed being 3,000 revolutions per minute and the temperature 290 degrees C. With a load of 1,365 kilowatts and a steam pressure of 130 pounds per square inch, the temperature being 294 degrees C, the speed remaining the same, the steam consumption was 19.6 pounds per kilowatt hour. With a load of 1,920 horse-power, the speed being 3,800 revolutions per minute and the temperature 300 degrees C., the steam consumption was 17.4 pounds per kilowatt hour with a steam pressure of 170 pounds per square inch.

One of the most important types of steam turbines constructed on the continent of Europe at the present time is that of Prof. A. Rateau, of Paris, built by Sautter, Harle & Cie. The accompanying illustration, Figs. 7 and 8, shows

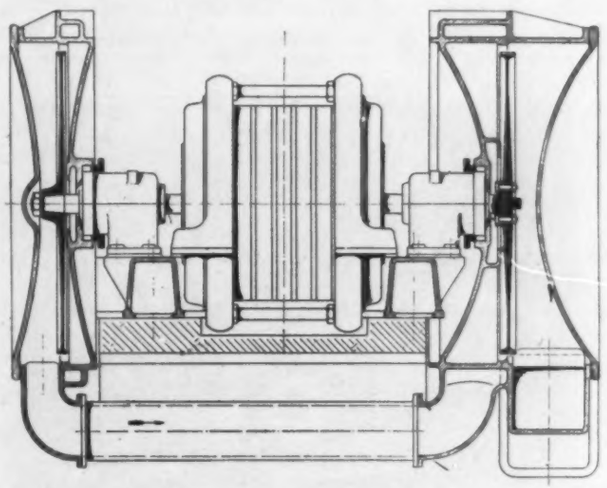


FIG. 4. 2,000 H. P. RIEDLER-STUMPF STEAM TURBINE

the details of construction of these turbines which are of more than passing interest. One of the first turbines constructed by Prof. Rateau was built with a single moving wheel, formed with vanes in the shape of a double arc milled out of a solid block of steel, the buckets being similar to that of the Pelton wheel. This type was similar to the Delaval turbine and the Riedler-Stumpf turbine. The latest type of Rateau steam turbine is one in which the expansion of steam is carried out in the distributor for each group and moving wheel, it being of the reaction type and acting by its velocity and not by its pressure. The Rateau steam turbine is said to be of the multicellular form, consisting of a number of elements, each of which includes one moving wheel and one distributor. The wheels are said to revolve in a chamber where the pressure is uniform, and it is claimed for this reason that there is an absence of longitudinal thrust upon the moving parts so that there is no necessity for the use of dash pots for overcoming the effect of this thrust. In the Rateau turbine the moving wheels are constructed of discs of thin sheet steel, and upon the periphery of these discs are riveted the cylindrical vanes, while a steel band is riveted to the periphery to maintain the correct spacing of the vanes and to produce a rigid structure. The moving wheels turn between circular diaphragms which are provided with the distributing vanes, these entering into grooves formed in the interior of the turbine case.

The shaft passes through the diaphragms in collars of anti-friction metal, with very slight friction. In the first diaphragm through which the steam passes, the distributing frames are placed upon only a part of the circumference. Partial injection of the steam is therefore obtained, and thus the velocity of the steam is better utilized. Moreover, to produce the same effect, the useful part of each distributor is set with an angular advance on the preceding section; the angle of advance is calculated according to the speed of rotation, so that the steam leaving one moving wheel enters into the following distributor and never encounters a solid wall which would produce a shock, and therefore a loss of kinetic energy. For the last wheels it is necessary to employ total injection, that is to say, the distributing vanes must be set upon the whole circumference of the diaphragm, and moreover, owing to the expansion of the steam, the radius must be increased. The bearings of these turbines are external, and by means of a special system of spring packing they are kept perfectly tight. No oil is carried by the exhaust steam to the condenser, and this

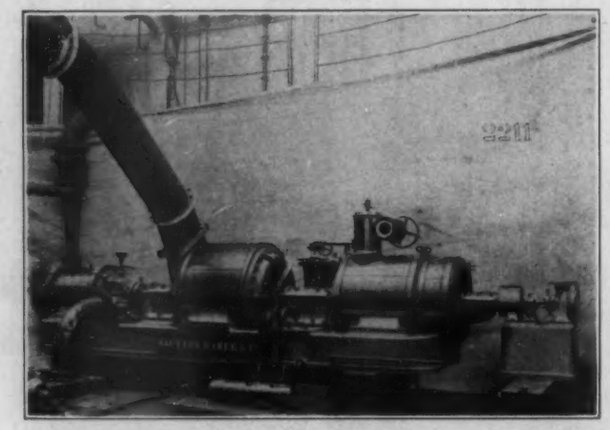


FIG. 5. RATEAU STEAM TURBINE

has an important advantage, as the water of condensation can be used for feeding steam boilers direct without any necessity for the use of an oil-separator. The speed of

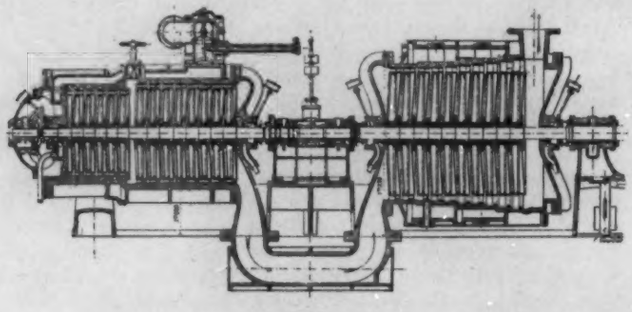


FIG. 6. 500 H. P. RATEAU STEAM TURBINE

rotation is controlled by a centrifugal governor with a Denis compensator, which acts upon an obturator which controls the pressure of steam entering the turbine.

Prof. A. Rateau in a recent paper on "The Different Applications of Steam Turbines" before the Congress of Mechanical Engineers in Chicago, gives the following most interesting data in reference to the direct current turbo-dynamos shown in the accompanying drawing, Fig. 8; "The company of the mines of Penarroya, in Spain, installed in their central electrical lighting station a little more than a year ago, three groups of turbo-dynamos developing 500 electric horse-power with direct current at 240 volts. Each of these three generating sets comprises two turbines for high and low pressure, and two dynamos for direct current; the latter directly driven from the turbines upon the same shaft and upon the same bedplate, and the two dynamos supply a three-wire network with a potential of 480 volts between the outer wires."

"The speed of rotation is about 2,200 revolutions per minute, and the floor space occupied by the turbine with its two portions is only 12x5 feet 6 inches, with a height of 5 feet, inclusive of a bedplate 1 foot high. The condensation of the steam is carried out by means of ejector-condensers of a type designed by the author."

"The work's tests of the first group were made in September, 1902, with the greatest care, and they have given the results which are shown in Table 1. The condensation was made for these by means of a surface condenser belonging to the works, so that the water of condensation might be collected and measured. It will be seen that the vacuum at the condenser declined as the power increased. This result arises from the fact that the condenser was designed for machines of 250 horse-power only, and therefore was of insufficient size for the larger volumes of steam."

(To be continued.)

REPORT OF LIBRARIAN OF THE PACIFIC COAST GAS ASSOCIATION.

Owing to the unsettled condition of the office, where it would be necessary to house the library, your librarian has not spent much money for books during the past year, and might be accused of over-conservatism for not having more rapidly rehabilitated the library.

During the year, some of the most useful books relating to gas and allied subjects have been purchased, particularly some of the older books, which we were fortunate in getting.

The total expenditure of money for the year was $57.95. The library now consists of 66 volumes.

Conditions are improving, and the quarters of your librarian are now such as would warrant the purchase and storing of valuable books, providing they are amply covered by fire insurance.

During the year, our collection of books has been freely used by the members, and the value and usefulness of a Gas Association Library has been well proven.

At our last meeting, Mr. L. P. Lowe kindly offered to donate book cases for any books we might acquire, but conditions have not warranted us in accepting his offer.

The library fund now amounts to $1446.44. It is recommended that during the coming year, a considerable amount of this money be expended for books, and that we avail ourselves of Mr. Lowe's offer to furnish the book cases to contain them.

Respectfully submitted,

E. C. JONES, Librarian.

SULFUR AND OIL GAS.*

By P. W. Prutzman.

Sulfur is one of the most widely distributed of the elements, and is found in every portion of the earth's crust, often in considerable quantity. It occurs native in enormous deposits, and is found in some proportion in all metallic and in many non-metallic minerals. It is an essential constituent of almost all forms of plant and animal life, and is found in appreciable quantities in all but the purest air and water.

It is therefore not surprising that it is found in more or less quantity in all organic minerals, such as petroleum, coal and peat, and as it passes readily and almost completely into the gas made from these substances, and its presence in the gas is highly detrimental, the removal of this substance from the raw material or from the crude gas has engaged the attention of the gas fraternity from the earliest days of the industry.

Pure sulfur, while occurring in several forms, has in all the same chemical properties. It is one of the most reactive of the elements, combining directly with air, with moisture, with many metals, and with a large part of the known hydrocarbons. With hydrogen, sulfur combines to form hydrogen sulfid, a combustible gas, very soluble in water, and with a very foul and nauseating odor. The compounds of sulfur with the hydrocarbons resemble hydrogen sulfid in their main chemical properties, but are much less soluble, and less reactive with chemicals. They are combustible also, range in physical properties from a light volatile liquid to a heavy high boiling oil, and display every degree of stench known to science or uncleanliness.

Free sulfur and all its combustible compounds burn at a very low temperature, in the presence of oxygen, to sulfur dioxid. This is a gas, soluble in water, of strong acid reaction, suffocating and irritating when breathed, but not poisonous. In itself it is not objectionable in the quantities produced from the burning of very bad gas, unless at times in a very close room. But unfortunately for the gas maker, sulfur dioxid in the atmosphere rapidly unites with water, producing sulfurous acid. This again takes up oxygen from the air, forming sulfuric acid. As is well known, this is the most caustic and corrosive of acids, poisonous in quantity, attacking metals, discharging the colors of dyes and pigments, and destroying the strength of all fabrics except those of wool. It is to the formation of this acid from the combustion products of sulfur bearing gas that practically all the bad effects are due, as while hydrogen sulfid blackens metals, and is probably detrimental to health to some extent, the cases where notable amounts could escape unburned are rare.

Petroleum is a very complicated mixture of similar and dissimilar bodies, and as such sulfur is not at all an essential constituent, though it is seldom that an oil is found which is free from it. This is probably due to the fact that oil producing regions are usually centers of geological and chemical activity, and in such free sulfur is always present in the earth's crust, and usually in considerable though highly variable amount. As sulfur is freely soluble in oil, and also combines with it readily at low temperatures, it is evident that the presence of free sulfur in any portion of the earth within the radius from which the well draws would account for a sulfur bearing oil. In some parts of Texas, where the oil is produced from heated strata carrying enormous percentages of sulfur, oils are found so thoroughly saturated that sulfur crystallizes out on cooling.

The behavior of petroleum with sulfur seems to depend largely on the general chemical constitution of the oil, and no definite rules can be formulated in the present state of our knowledge. Some oils carry their sulfur principally in the free state, that is, in mere solution, as sugar might be dissolved in water. Others carry large amounts of sulfur very firmly combined, in the form of mercaptans, etc., these oils being very refractory in the refinery, and about equally so in the gas works. What differences in conditions lead to these varying results we do not know. When sulfur, as such, is mixed with a sulfur free oil, in the cold, it merely goes into solution. If the temperature of the solution be increased, the sulfur appears to go into combination between 300 degrees and 400 degress Fahrenheit, taking hydrogen from the oil to form hydrogen sulfid, which is given off, and leaving a residue of asphalt or of free carbon, as the case may be. Ordinarily the reaction is complete at about 400 degrees, if sufficient time is allowed, and as a rule very little or none of the sulfur remains in the residue. But on heating an oil containing considerable combined sulfur, the compounds break down only at a much higher temperature, usually 600 degrees Fahrenheit or more, and then not completely to hydrogen sulfid, but partly to lighter mercaptans, while a portion appears to distil over unchanged.

The import of this difference to the gas maker may not appear at first sight, but it is very real nevertheless. Hydrogen sulfid is a gas which is very soluble in water, and can be largely removed in the scrubbers without the use of excessive amounts of water. On the other hand, the mercaptans are present in the gas as vapors of liquids, which are not particularly soluble, and while a portion is held back by the condensers, a considerable amount passes forward to the scrubbers, where it can be removed only by long continued washing. As this is not only expensive of itself, but has a strong tendency to degrade the candle power, the objections are evident, and in fact in most cases the amount of scrubbing, and the temperature of the water used must be determined by other considerations than the effect on the sulfur percentage.

It is here that one means of relief for the purifiers is suggested. If any way can be found by which the percentage of combined sulfur in the gas can be decreased, with a corresponding increase in the proportion of hydrogen sulfid, a gain is made. For while, as stated, the completeness of removal of the mercaptans will vary with the time of scrubbing and the temperature of the water, and directly with the original percentage of mercaptans, in the case of hydrogen sulfid the completeness of removal will, on account of the ready solubility of this gas, vary only with the temperature of the water, and be very little effected by the time of scrubbing, and almost none by the amount of original impurity. This last point may be made clearer by a homely illustration. Suppose that some one should pile an inch of flour on one side of the brim of your nice black hat, and a sixteenth of an inch on the other side. It would be no more trouble to remove the inch than the sixteenth, but you would find the removal of the last traces a matter of some difficulty in either case.

When we pass the gas to the scrubbers, we find the same difference. Hydrogen sulfid is readily removed by the usual treatment with lime or oxid, while the removal of the mercaptans is much slower, requiring more time and purer chemicals. Even then, it is doubtful if any method of purification in present use is able to entirely remove the mercaptans in any practicable length of time. The addition of caustic soda, sprayed onto the purifying mass, has been suggested, though whether it has been tried, and if so with what results, I do not know. Soda is used for this same purpose in oil refining, but only after the oil has been acted on with strong sulfuric acid, and it seems very likely indeed that in this case the sulfur compounds are first converted into sulfonic acids or similar bodies, which have a strong affinity for alkalies. If this be true, the analogy would not apply, as, of course, an acid treatment for gas is out of

* Paper read before Fifteenth Annual Convention Pacific Coast Gas Association.

the question, the best part of the illuminants being soluble in sulfuric acid. On the whole, considering the cost of purification and the great increase in the size of plant attending any lengthening of the time of contact, I consider it very doubtful whether any progress toward a solution in this direction is possible.

We are left, then, with four directions in which aid may be sought. The first would be, where any choice is practicable, to select the oil containing the least sulfur, or as between two oils of the same gross percentage, that containing the most free and the least combined sulfur. The first test is simple and easy enough: analysis alone is the safe guide, and every purchaser of crude oil for gas making should be equipped to make this simple test. Oils vary greatly in sulfur content in different fields, and while averages for the fields could be gven, they would be of little value, as individual wells in one district vary as greatly as the field averages. As to the relation between free and combined sulfur, no such royal road is laid down. The method of testing outlined below gives good general ideas in the hands of a trained operator, but these results cannot be reduced to figures, and depend largely on the manipulator's judgment.

Having first determined total sulfur by the usual method, the samples to be compared are slowly distilled from glass flasks, having side necks but no jackets. If sulfur collects in the neck of the flask while water is distilling over (i. e., at about 250 degress Fahrenheit), or if much hydrogen sulfid is given off below 400 degress Fahrenheit, considerable free sulfur is indicated. If little or no hydrogen sulfid is formed between 400 and 600 degrees, a considerable amount at or above the latter temperature indicates a large proportion of combined sulfur and an oil likely to run to tar or lampblack, while free sulfur forming in the neck of the flask at this temperature indicates the same as regards combined sulfur, but points to an oil likely to require high heats in fixing. Of course these results are very general, and they give no information at all on the most important point, that of the comparative ease with which the mercaptans will break down in the machine. A really practicable and fairly accurate test to this end would be of great value where there is any choice of oils, and such could undoubtedly be worked out with time and patience.

If we eliminate overscrubbing, which is undoubtedly effective, but usually limited by other conditions, our last resource is in the manipulation of the gas making apparatus. The sulfur compounds of petroleum show a strong tendency to break down to hydrogen sulfid and carbon at moderate heats, but this change takes place but slowly. It is accelerated by contact with highly heated, rough walls or baffles, but here we meet the limitation that the conditions most favorable to the destruction of the mercaptans are also those most favorable to the production of naphthalene and loss of candle power. This is a phase of the question on which I am not competent to dwell; it may be that there are prospects along this line, though I am not able to see them.

Many suggestions have been made looking to the removal of sulfur from the oil before use in refining or gas making, but with one exception these seem to be based on a misunderstanding of the conditions. Not only is the bond of union in these sulfur compounds a very firm one, but the affinity between the oil and the sulfur is such that any free sulfur will attack the oil before it will unite with any other substance, with the possible exception of caustic alkalies. As these would rapidly destroy heated firebrick, there seems to be little hope of finding any substance which, being added to the oil before use, would fix the sulfur, and prevent its being carried forward into the gas.

As to attempts to wash out the sulfur, a glance at the physical nature of crude oil would show that such attempts must be abortive. Aside from the fact that no chemical, except strong sulfuric acid, has yet been found which will wash out any material portion of the sulfur from oil, the difficulty of removing the washing materials, due to the viscosity of the oil, and the time and plant investment required for mixing and settling, put such means entirely out of the question.

The only method of this character which seems to offer any hopes whatever of success is simple distillation. By slowly distilling the crude, a large portion of the sulfur is either carried away in the gas, which accompanies the distillation, or left behind in the asphalt, and by a simple modification of the usual process a distillate may be had which is practically free from sulfur. The cost of this distillate would of course depend on the scale of operations, the market, and relative price for asphalt, and other factors. In no case should the distillate cost more than a few cents a barrel more than crude, and under favorable circumstances there might even be a profit in the distilling operation, so that while the initial investment would be considerable, yet in cases where the process permits the use of distillate to advantage, and where purification has become a serious problem, there might be some advantages in this method.

HISTORICAL DATA—GAS AND ELECTRICITY.

Electricity.

Faraday made his discovery in the magnetic induction principle in 1831. Shortly after Faraday's discovery, machines on this principle were devised by Dal Negro and Pixii. In 1832 Pixii made a second machine, supplying it with a commutator for rectifying the alternating currents. The above machines used permanent magnets to supply the magnetic fields.

Electro instead of permanent magnets were first patented by Wheatstone in 1845. In 1867, Dr. W. Siemens brought out a self-excited D. C. generator, driven by mechanical power, and to describe it coined the phrase, "Dynamo Electric Machine."

The first constant current open coil machines were brought out in 1880 by Thomson & Houston, but it is stated that the first succcessful machine was operated in Philadelphia some months earlier than this. The earliest record of the use of a single phase alternator, is a machine designed by Nollet, Holmes and others in France, and used successfully from 1863 in the light-house of that country.

The first polyphase alternator did not come into general use until after 1890.

Edison's first successful incandescent lamp was completed in 1879.

The discovery of the electric arc is accredited to Sir Humphrey Davy, a little over a century ago. It was not brought into practical use for lighting, however, until after the introduction of the dynamo.

Faraday made the first transformer in connection with his early experiments. The magnetic circuit of this transformer was a closed ring of iron. Following transformers used straight iron cores, until Varley, in 1856, pointed out the advantage of using a closed magnetic circuit. This gave rise to the shell type transformer, which was used until the General Electric Company brought out the Type H core type transformer in 1895.

The first series incandescent system was installed by Mr. H. H. Cutler in Watertown, Mass., about 1886. These lamps were used in series in a special socket direct across a 100-volt alternator.

IN MEMORIAM.

WILLIAM G. BARRETT.

Born, December 12, 1822. Died, August 8, 1907.

The Pacific Coast Gas Association mourns the loss of one of its Charter Members, who was also an Honorary Member of the Association, and the gas fraternity has lost one of its oldest and best beloved members by the death of William G. Barrett, of Oakland, California, who for nearly 50 years was identified with the lighting interests of San Francisco.

Mr. Barrett was born in Chester, Vermont, December 12th, 1822, and crossed the plains in 1850 to the Placerville region in California.

In 1860 he became Collector, and in 1862 Cashier and General Bookkeeper of the San Francisco Gas Company, while in 1877 he was elected Secretary and Treasurer, holding this position through the various mergings and successive ownerships of the San Francisco lighting interests until 1902, when he was retired as Secretary emeritus of the San Francisco Gas & Electric Company.

Mr. Barrett was one of the early members of the old Union Club, and afterwards of the Pacific Union, as well as of the Bohemian Club, of San Francisco.

When the Pacific Coast Gas Association was formed, July 11th, 1893, the deceased signed the roll of Charter Members No. 4, and on July 16th, 1902, he was unanimously elected an Honorary Member of the Association. During these years he was a constant attendant upon our meetings, and, although not an active participant in the discussions, his genial and kindly presence, and the love which we all bore him, brought sunshine into our midst.

Mr. Barrett died at his home in Oakland on the morning of Thursday, August 8th, 1907, after a brief illness. Besides his widow, he leaves a son, Charles L. Barrett, who succeeded to his father's position in the San Francisco Gas & Electric Company, and a daughter, Mrs. Stetson G. Hindes.

The Pacific Coast Gas Association was represented among the pall-bearers at the funeral, which occurred Sunday, August 11th, at Oakland, California, and sent a floral tribute in the form of the badge of the Association. Floral pieces were also sent by the employees of the San Francisco Gas & Electric Company, all of whom looked upon Mr. Barrett as a dear friend and counsellor.

IN MEMORIAM.

ERIC C. RANDALL.

We mourn the loss of one of our true and faithful members, Eric C. Randall, who died November 23, 1906, at his home in San Jose, California. He was born in Crimsby, Ontario, Canada, in 1855, and at the time of his death was 51 years of age.

Mr. Randall came to California eighteen years ago, and was employed as general agent for the Los Angeles Gas Company. He afterwards came to San Francisco, where he held an important position in the stove department of the San Francisco Gas & Electric Company. Following this, he went to San Jose, and was for many years employed by the San Jose Gas and Electric Company as their expert, when the Welsbach gas lights were first introduced into that city. He later invented a gas furnace and engaged in business for himself, as manager of the California Gas Furnace Company.

Mr. Randall joined the Pacific Coast Gas Association at its second meeting, held in Sacramento, May 15, 1894.

In 1897, he was married to Miss Catherine Denne of San Jose, who survives him.

We offer to those who survive him our sympathy and condolence.

FIFTEENTH ANNUAL CONVENTION OF THE PACIFIC COAST GAS ASSOCIATION, HELD AT SANTA CRUZ, SEPTEMBER 17, 18 AND 19, 1907.

TUESDAY, SEPTEMBER 17th.

The Fifteenth Annual Meeting of the Pacific Coast Gas Association was called to order at 2:18 p. m., September 17th, 1907, by the President, Mr. John Martin.

On motion duly seconded, the formal roll call was dispensed with.

The following members were in attendance—both regular and associate:

Regular.

R. P. Valentine,
H. E. Adams,
Victor Etienne, Jr.,
E. L. Hall,
C. E. Roesch,
Chas. T. Stamps, Jr.,
Z. T. Bell,
E. B. Walthal,
C. M. Grow,
W. E. Jason,
John F. Parker,
B. S. Pederson,
A. E. Hursh,
F. A. Leach, Jr.,
F. E. Fitzpatrick,
Geo. L. Benbow,
Leon P. Lowe,
E. C. Jones,
J. E. Poingdestre,
Van E. Britton,
Sam P. Hamilton,
John Clement,
Geo. S. Colquhoun,
John Werry,
Sherwood Grover,
R. H. Sterling,
H. B. Heryford,
O. E. Clark,
R. L. Cardiff,
Paul C. Funk,
L. H. Newbert,
J. D. Kuster,
W. L. Delaney,
H. R. Bashford,
Geo. W. Hark,
S. Waldo Coleman,
Benj. T. Pierson,
R. L. Clark,
Chas. Hughes,
Robt. H. Hargreaves,
Worth W. Wilson,
Fred. I. Reynolds,
E. F. Oswald,
H. O. Byerly,
Robt. J. Thompson,
Geo. H. Hollidge,
Jno. Martin,
John A. Britton,
Henry Bostwick,
E. A. Rix,
W. E. Osborn.

Associate.

California Light & Fuel Co., San Francisco, Cal.
Chico Gas & Electric Co., Chico, Cal.
Colusa Gas & Electric Co., Colusa, Cal.
Nevada County Gas & Electric Co., Nevada City, Cal.
Palo Alto Gas Co., Palo Alto, Cal.
Stockton Gas & Electric Co., Stockton, Cal.
Suburban Electric Light Co., San Leandro, Cal.
The W. F. Boardman Co., San Francisco, Cal.
Watsonville Light & Power Co., Watsonville, Cal.
Woodland Gas & Electric Co., Woodland, Cal.
Journal of Electricity, Power & Gas, San Francisco, Cal.
The Edison Electric Co., Los Angeles, Cal.
Marysville Gas & Electric Co., Marysville, Cal.
P. J. McCoy, San Francisco, Cal.
Geo. W. Ackerman, San Francisco, Cal.
Fred Williams, San Bernardino, Cal.
J. D. Farwell, Los Gatos, Cal.
Oakland Gas, Light & Heat Co., Oakland, Cal.
San Francisco Gas & Electric Co., San Francisco, Cal.
United Gas & Electric Co., San Jose, Cal.
Schneider-Trenkamp Co., San Francisco, Cal.
Standard Meter Co., San Francisco, Cal.

As the minutes of the last session have been distributed to all members, on motion duly seconded, the reading of the same was dispensed with.

The Secretary then read a telegram from the W. F. Boardman Company of San Francisco, donating $100.00 to the Library Fund.

On motion duly seconded, it was unanimously voted to extend the thanks of the Association to Mr. Boardman for his kindness.

The report of the Secretary and Treasurer was then read, and the following committee was appointed to report on the same: Messrs. Fitzpatrick, Newbert and Leach.

The Secretary was ordered to cast the ballot covering the election of all new members, as mentioned in his report, and he thereupon announced that all the applicants were duly elected to full membership.

The Secretary announced that there was no meeting of the Board of Directors on the evening of the 16th, as has heretofore been the practice, owing to no quorum being present.

The Chairmen of the various committees announced that they had no progress to report at this meeting.

The report of the Librarian was then presented and accepted as read.

The Secretary announced that the Union Traction Company of Santa Cruz had tended the free use of their cars to members and their families during their stay in Santa Cruz, and on motion, duly seconded, the Secretary was instructed to extend to that Company a vote of thanks.

The President then announced that the present members comprising Committee on Gas Engineer's Degree, Committee on Permanent Home and Advisory Board, would be appointed to succeed themselves.

Mr. Jones announced that at the last meeting, Mr. Lowe had expressed his willingness to donate to the Association a set of sectional book-cases, but up to this time the affairs of the Library were not in such shape as to accept the same. However, as the Library will now be rapidly rehabilitated, he suggested that Mr. Lowe's offer be accepted at this time, and a vote of thanks tendered him, and on motion duly seconded, the Secretary was instructed to take such action.

The President: The next order of business is Miscellaneous Matter.

Mr. Britton: I have nothing more, Mr. President.

President's Address.

Mr. Lowe: I presume in my capacity of Junior Past President, and in the absence of the Vice-President, it devolves upon me to appoint the customary committee to report on President's Address, and if there are no objections, I will appoint Messrs. E. C. Jones, Van E. Britton and E. A. Rix.

The President: We will now hear from Mr. E. C. Jones, a paper entitled, "A Recent High-Pressure Installation."

The President: You have heard this very valuable paper on high-pressure installation, by Mr. Jones. I would like to have the members enter freely in a discussion of the same.

Mr. Rix: I would like to ask Mr. Jones a question. Would you deem it advisable, if it could be economically handled, to compress gas at 300 pounds pressure, in the event of a surplus of sulphur in the gas, and then will it take up the lost hydro-carbons?

Mr. Jones: The advisability would depend entirely on the cost of the power for running the compressor—it is a local question. There is no doubt in the world that if compression of gas is raised to 200 pounds, the gas would be free from naphthalene, and, as I explained before, any other hydrocarbon that would drop down, such as benzol, would reappear in the gas, and the candlepower be restored.

Mr. Rix: It won't pick up the other?

Mr. Jones: It won't pick up the naphthalene or sulphur compounds. The cost of compression is, of course, a matter that is subject to local conditions.

The President: A statement was made by Mr. Rix, in his discussion with regard to the couplings being designed to stand only 100 pounds pressure; possibly Mr. Jones can enlighten us on this subject.

Mr. Jones: I don't think that Mr. Rix means to convey the idea that any of the more recent high-compressor couplings would leak at anything like 100 pounds; I understand that the best of them will stand up to 1,000 pounds. A first-class coupling should be tight and stand 1,000 pounds pressure to the square inch. We have been in the habit of testing our medium and high-pressure lines at 100 pounds pressure; that is even beyond the economical limit of single-stage compression, and we endeavor to carry the pressure on our lines below 100 pounds, if possible, on account of the cost of compression.

The President: Did Mr. Rix take into calculation the question of interest on calculations of the various sizes?

Mr. Rix: I assumed ten per cent interest and depreciation.

Mr. C. M. Grow: I did not attend the meeting last year, but two years ago I was present, and from Mr. Rix's pamphlet, I got the idea of high-pressure distribution. Since that time, I have learned something more about high-pressure gas. We have installed a high-pressure system at Highland, a little colony of orange growers, situated six miles from San Bernardino. Our high-pressure distributing system consists of two receivers and twenty-two miles of two-inch line pipe, and on that line we have a service on either side about every quarter of a mile throughout the whole district. I will say, in the beginning, that the system is laid very much as Mr. Jones described in his paper, without any elbows or fittings that could be eliminated. We used Dresser couplings, and also installed a gate valve every 1,000 feet. We bent the pipe around all corners and tied in with clamps of special design. Every section of 1,000 feet was tested for leaks with 180 pounds air before being covered. The average pressure is forty-five pounds at the plant, and is also the same at Highland, while the line pressure runs down from fifty pounds to fifteen pounds, yet the pressure at the consumer's meter does not vary more than one-tenth water. We find in the practical operation of it that there is absolutely no naphthalene or water; at least there never has been a complaint since we installed the system from these two causes, and that was something like five months ago. If anything has occurred, the men on the system have caught it. There has never been a single complaint come through the telephone. We have never noticed any drop in candlepower; of course, there may be a slight drop, but we never noticed it in the lights. Gas arc lights which have been installed three months have never had to be cleaned or adjusted, which bears me out in the statement that this gas carries no foreign matter, but is perfectly purified by compression. As to the cost of compression, I am not in a position to state. We use a steam-driven compressor and the fuel is our lamp black. We only operate the compressor three hours a day, as this is sufficient to supply the demand. Another beauty about the system is that we do not need any holder, and I believe, as suggested by Mr. Jones, that the money put in to the holders themselves and the land on which they stand could be much better used in pipe lines to reach the consumers. This Convention ought to point out the fact that the low-pressure system is obsolete and the high-pressure system is the only thing.

The President: Mr. Valentine, can you favor us with something on high pressure?

Mr. Valentine: I am compelled to dispute Mr. Jones' statement a little bit. I have had trouble with the high pressure, having found water in the mains.

Mr. Jones: At what pressure?

Mr. Valentine: Fifteen pounds.

Mr. Jones: That isn't high pressure (laughter). The benefit to be derived from compression begins in the vicinity of forty or fifty pounds to the square inch, and continues up to 300 pounds, but it isn't necessary to compress gas to 300 pounds to obtain benefits of purification and get rid of water and the impurities in gas. Gas compressed to 100 pounds is practically free from naphthalene, but at 300 pounds gas is perfectly purified.

Mr. Pederson: I want to question Mr. Jones about the picking up of the benzole and water vapor. How do you separate them? Is there any separation?

Mr. Jones: It is not necessary. They separate themselves in the tanks; the gas is in such a thirsty condition, it is ready to again pick up the benzole and restore to itself the candlepower that it originally had; that is, the hydrocarbons squeezed out of the gas are again taken up, so that the gas has its original candlepower.

Mr. Van Britton: Between our compressor and storage tanks, we have about 250 feet of four-inch pipe, and just where we take the gas into compressor I put in a drip. We compress the tanks up to 85 pounds, which is our maximum, and never going below twenty pounds. About once a day we take out from the drip cock a rich, creamy fluid. Would it be better to retain this?

Mr. Jones: I think, Mr. Britton, I would take the drip out of that line entirely. I would arrange the piping so as to drip into the tank.

Mr. Valentine: Does the temperature have anything to do with the deposit of water or benzole?

Mr. Jones: Surely. It is a natural law that gas in contact with water at the same temperature and pressure contains the same amount of water vapor. It is expressed as relative humidity in the atmosphere. At times, of course, you can get more water out of gas than at other times.

The President: Mr. Valentine, why should you have any drippage in the line, if you have extracted all the moisture?

Mr. Valentine: We did get it at points 5,000 or 6,000 feet from the compressor.

The President: At high pressure?

Mr. Valentine: At about twenty-five pounds.

Mr. Jones: Mr. President, I understand that at twenty-five pounds pressure, there is about one-third of the water compressed out of gas.

The President: Mr. Jones, would you enlighten the members of the Association by answering this question: Is it more advantageous, at additional cost, to compress gas to, say, seventy-five or eighty pounds, in preference to twenty pounds pressure, because of the removal of the condition of which Mr. Valentine and others have spoken?

Mr. Jones: I believe that it is; I feel sure that at reasonable cost, it would pay us to avail ourselves of the purification element of compression, the cleansing of the gas by compression and the getting rid of the water, even though we undo what we have done in raising the pressure by liberating the gas at a lower pressure.

The President: Is there any further discussion on this paper?

Mr. Hargreaves: How high can pressure be carried on cast-iron mains?

Mr. Jones: I don't think it would be a matter of pounds. We, in San Francisco, have been able to carry it as high as twenty-two inches from a gas fan and somewhat higher on independent feeding lines. Lead joints are apt to leak, but the lead joint and its elasticity saved the cast-iron main gas systems during the earthquke in San Francisco. If we had used cement joints, so common in some sections of the East, we would have had a rigid, unyielding joint, which would have resulted in the shattering of our pipes.

The President: Mr. Jones, would you kindly explain to the members the utilization of high-pressure transmission in connection with low pressure?

Mr. Jones: I prefer, instead of taking services directly from a line carrying very high pressure, to take them from a parallel line of wrought-iron mains carrying four or five pounds. We are getting too familiar with the term "High Pressure." I can remember the time when the one and one-half-inch water pressure was all that we could carry for our consumers, and we considered four inches prohibitive. Now, at four pounds pressure the service is absolutely perfect, and many of the dangers to meter and governor are eliminated by using this medium pressure. The gas, if it has been raised to eighty pounds, and dropped again to four pounds, is still free from water, and has all the advantages of the higher-pressure gas.

Mr. Valentine: Would you advise using the old cast-iron system, if installed, or put in a new one?

Mr. Jones: In the event of your having a cast-iron system, I would advise feeding into it at various points with just enough pressure to give good low-pressure service.

The President: I can no longer restrain Mr. Britton from speaking. Mr. Britton, please.

Mr. Britton: I dislike very much to take any exception to what Mr. Jones has said with reference to the utilization of cast-iron pipes for high pressure, but mainly speaking (being something of a pioneer in high-pressure distribution myself), I state this to be a fact, that the first high-pressure distribution of gas was made in the little village of Oakland, across the bay from San Francisco. I think that can be stated as an historical fact, and the very first installation was made from the plant at First and Washington Streets, by means of a four-inch cast-iron pipe, leading across from the estuary, then by means of a three-inch cast-iron pipe, a distance of, possibly, two and one-half miles to the holder at Alameda; the gas was pumped through that cast-iron pipe daily for five or six years at a pressure of about twenty-five pounds to the square inch. Subsequently a pipe was laid across the upper end of the Estuary, through East Oakland and around by the way of Park Street, which pipe is still in existence underneath the drawbridge, and a pressure was maintained on that line as high as thirty pounds to the square inch. I never could discover any difference in candlepower at that time, nor was there any apparent increase at all in our leakage account. The pipe across the marsh, through Alameda, was abandoned, simply because it grew too small for the uses of Alameda, and not because it was leaky, and these were lead joints.

We had trouble with the pressure at the Town of Berkeley, about six miles distant from Oakland, and did not have the money at that time to lay sufficiently large pipes to give them pressure. Running out Grove Street, nearly its entire length, to the town of Berkeley, we had six-inch and four-inch mains, cast iron, with lead joints, and through that pipe, day in and day out, we served the town of Berkeley, and everybody along that four and six-inch cast-iron pipe at twenty-five pounds, reducing pressure at each service by an individual governor. The pipe was stripped repeatedly, and I never could discover, by personal observations, that a single joint had been pulled out to an appreciable amount. I think that a whole lot of discouragement is given to gas men regarding installation of high-pressure lines by a mistaken idea of the cost of compression. Figured out theoretically and from an actual dollar-and-cents standpoint, it is not an expensive installation to make. I don't want to be understood by my first remarks, with reference to the stability of cast-iron pipe, as advocating it for the higher pressures, but I am a very strong advocate of the plan of Mr. Jones of feeding into low-pressure lines by means of district governors. With all of the uncertainties in many ways resulting from high-pressure direct distribution, I don't think we should advocate, as engineers, installation of individual services on high-pressure lines.

Mr. Leach: While on the line of Mr. Jones' paper, I wish to say that in Oakland at the present time, we are not distributing under high pressure, as our greatest compression is only twenty pounds; at the same time, I want to say that we have an excellent opportunity of comparing the delivery of the same gas, made at practically the same time and taken from the same source under the different conditions. In

Berkeley and in Alameda, and in a portion of the outskirts of Oakland, our entire output is compressed. In the central portion of the town the gas is delivered by a thoroughly low-pressure system. Whenever we have any difficulty from naphthalene or excessive moisture, the trouble is always in the lower-pressure portion of the district.

Mr. Jones: I would like to say with reference to Mr. Britton's remarks, that in all of my experience, I have never seen such excellent street-main work as they have in Oakland—work that was done many years ago.

The President: Mr. Kuster, have you anything to say?

Mr. Kuster: I am sorry to say that I did not hear Mr. Jones' paper, as I came in a little late. We have a little high-pressure system in Fresno, and as far as leaks are concerned, it has given us no trouble. There is something that differs a little from Mr. Leach's statement, in reference to naphthalene; the high-pressure lines have given us more naphthalene troubles than all our low-pressure system put together.

Mr. Jones: Do you use compression tanks?

Mr. Kuster: No; but we are about to install them.

The President: Before the subject is passed, I want to take issue with Mr. Britton in regard to some of the statements that he has made, having been in the electrical industry for a number of years, and somewhat of a pioneer, in not only high-pressure gas distribution, but in high-pressure electric transmission. We have been accustomed to making high-pressure connections directly to the house, involving great elements of risk if the devices were not safe and secure. It seems to me that we are "pinning high-pressure feathers" all over ourselves and our foreheads, with the idea, probably, that we are the only "Indians" that know anything about this subject; as a matter of fact, the natural-gas men of the East and Middle West have forgotten more than we will ever know about high-pressure gas delivery. When a natural-gas man will connect a governor to a main containing 300 or 400 pounds pressure and connect directly to consumers' meters, and when you take into consideration the minimum amount of damage ever done by explosions or other accidents due to defective governors, I think it is safe to say that high-pressure delivery is safe, as well as high-pressure transmission.

The President: If there is nothing further on this subject, we will proceed to the next paper, which is by Paul W. Prutzman, entitled "Sulphur in California Oils." The paper will be read by the Secretary, owing to the absence of Mr. Prutzman.

The President: The members present who have had experience with sulphur and oil are invited to speak. Mr. Prutzman has outlined the conditions prevailing in the oil districts. I would like to hear from Mr. Lowe.

Mr. Lowe: I must confess that I am not in a position to discuss the paper, as I think it goes somewhat beyond the province of the ordinary gas man. It is quite true that it is a highly-interesting subject, and one in which we are all much interested, but I believe from a commercial standpoint that we cannot do very much more than accept in the oil what sulphur we must, and subsequently eliminate it from the gas.

The President: Mr. Jones, we would like to hear from you.

Mr. Jones: Mr. Prutzman suggests the partial distillation of oils for the purpose of getting from them distillates, and leaving a good deal of the sulphur in the base of the oil. We find that at times it is almost impossible to get crude oil, particularly the old fourteen-degree crude from Bakersfield, and we have been compelled to use distillates. Many of the distillates that we get to-day are crude oils with simply the tops moved, and we find that from the oil we have been getting, which has been partly distilled, our purification troubles arise. We have troubles that appear in a moment and it is difficult for a gas man to determine whether his purifiers are working satisfactorily; one moment he has no trace of hydrogen-sulphide in his gas, the next he has it to such an extent that fumes are noticeable in a room, and he doesn't know the cause. We find that some of the crude oils in California contain little sulphur, and with these we have very little trouble. I have some analyses of crude gas, made at the inlet of the purifiers. It gives us a line on the character of the gas that we are dealing with in the purifiers, so we do not condemn our men or the purifiers, because there is sulphur in the gas. These changes in oil occur so quickly that there are times when there is no trace of hydrogen-sulphide in the purified gas, when there are 200 grains in the unpurified gas; where there was 400 grains in the unpurified, we found fifteen grains in the purified gas, so that we depend largely on the people who sell us our oils for the amount of sulphur they give us; besides, in the breaking-down of combined sulphur by partial distillation, we must remember that where two barrels of crude oil contain a certain amount of sulphur, all this sulphur is contained in one barrel of the residuum oil, which the oil men call distillate.

The President: We now will hear from Mr. Britton.

Mr. Britton: In the early part of the manufacture of water gas on this Coast, when the only available oil was from Moody Gulch, in the Santa Cruz Mountains, near the tunnel at Alma, we used to get an oil of paraffine base. It was an oil of about thirty-eight degrees, Baume, crude oil. When that supply ran out, we tried Peruvian oils, which was also a crude oil of paraffine base, and when that supply became exhausted, and the California fields started producing oil, we began to run out into the heavier oils, into thirty-two-degree and forty-degree, or as low as fourteen degrees. Then the Kern River fields came in, and as the coal gas faded away, and the water gas became, of course, a factor in all of our cases, and Pennsylvania anthracite became too expensive, and Welsh anthracite became effective in the water gas, and depending, as we thought, upon a crude oil of a high gravity, and then distillates became a factor, it was then that our troubles really began; but what I wanted to say was that we attempted the very same thing that Mr. Prutzman has suggested, and we distilled the crude oils for a time at our works at Oakland, using the crudes that first came from the Coalinga fields. Unless we do as Mr. Prutzman states, I am afraid that we will have to bear up with the troubles complained of.

Mr. Hall: I would like to ask Mr. Jones if he has any analyses of the purified gas, showing the amount and nature of the organic sulphur not removed by the purifiers.

Mr. Jones: No, we have not.

Mr. Britton: Mr. Jones, unless you could specifically regulate the heats of your machines to the condition existing in your determination of the sulphur in the oil, would it be of any value?

Mr. Jones: At present, we do not know how to do it.

The President: But you do know if you have a larger percentage of sulphur in your gas?

Mr. Jones: Yes, sir.

The President: Are there any further remarks on this paper? If not, we will hear from Mr. Geo. S. Colquhoun, on "Repairing the Cup of a Two-Lift, 500,000 Cubic Foot Gas Holder."

Mr. Newbert, on "Comparative Economies in Operating Small Motors by Gas, Gasoline and Electricity."

The President: The members are very much interested in this subject, and I expect to hear from many.

Mr. Poingdestre, you ought to have something to say that will be of interest.

Mr. Poingdestre: I don't think I have anything to say about the matter; I think there are others here who are more competent to discuss the paper.

The President: Mr. Werry, we have not heard from you this afternoon.

Mr. Werry: We have not been troubled with any motors in our part of the country, and we have gas engines only at the gas works; we have a couple of them there; we have none in our vicinity, outside of the ones at the gas works, and I have never made much of a study of the same. I am sorry, but hope to know something more about it next year.

The President: Mr. Leach, we will now hear from you.

Mr. Leach: On the Coast—our part of the Coast, at least—we have had some little competition with the gasoline motor or gasoline engines; single-cylinder upright engines are the ones we have had, so far, to compete with. When it comes to a mere matter of cost of fuel, we have not been able to compete with it on an hour-to-hour cost. Our great advantage, up to this time, has been the reliability of the electric motor, over the present type of gas engines. If it has not been the automobile that has awakened the designers and builders of gasoline engines, there has been a general awakening along the line of internal-combustion engines, and unless the gas men take up the study of internal-combustion engines, I believe that other fuels will be used, and in the next five or ten years, we will have a very serious competitor to the electric motor, the gas engine thereby losing an important field of revenue. The two, three and four-cylinder engines that are now used in automobiles, of course, are much more expensive than can be afforded for ordinary mechanical purposes, but there are now in Oakland three or four large plants devoted entirely to the manufacture of multi-cylinder, internal-combustion engines, and I believe it behooves the gas man on the Coast to study it very carefully. There is now being put on the market a new type of a generator for distillate, which is being used with great success in connection with the Santa Maria oils. I was talking, recently, with a man from the Southern district, who uses gasoline engines for irrigation, and he is using one of the new-type generators, with Santa Maria oil. While I am not able to quote you the figures exactly, he was obtaining results of much less than one cent per horsepower hour for pumping purposes.

Mr. Clements: Mr. President, it is a fact that large plants are manufacturing gas engines in Oakland and vicinity, for I have had the pleasure of getting several contracts from them for electric power for their plants. Of course, that is not anything detrimental to their engines at all. In many cases electricity may be very profitably used, while, on the other hand, owing to conditions, location, etc., the small gasoline engine may be successfully used, and is successfully used, but for an ideal motor in most places, it appeals to the individual to use the electric at the present time.

The President: Are we having a gas meeting or electric? We should devote more of our time to the study of gas engines, with a view to the utilization of manufactured gas, which we produce for power purposes. Mr. Newbert, in his paper, called attention to the fact that the efficiency of the gasoline or gas engine was only twenty-four per cent, and the electric motor, ninety per cent. That probably will leave a wrong impression in your minds, for the reason that in one case you are dealing with a primary force, and in the other a secondary force, as electricity must first be generated with a prime mover.

The President: We will now hear from Mr. Britton, on his paper, entitled "History of Hydro-Electric and Gas Development in Central California."

The President: I will say that at the conclusion of the reading of this paper, and discussions, if any, I will appoint the Committee on Nomination of the Officers for the ensuing year, and we will then adjourn until to-morrow morning at 10 o'clock, sharp.

The President: I will appoint as a Nominating Committee, Messrs. Jones, Lowe and Britton, with instructions to report at to-morrow morning's session. The meeting stands adjourned until 10 o'clock to-morrow morning.

CIVIL SERVICE EXAMINATIONS.

The United States Civil Service Commission announces an examination on November 13, 1907, to secure eligibles from which to make certification to fill a number of vacancies in the position of constructing engineer, in the Forest Service, at salaries ranging from $1,500 to $2,000 per annum, and similar vacancies as they may occur. These positions are for field service in the western part of the United States, with no permanent station, and require much travel.

Applicants will not be required to appear at any place for examination.

Applicants should at once apply to the United States Civil Service Commission, Washington, D. C., for application Form 304 and special form.

The United States Civil Service Commission announces an examination on November 13, 1907, to secure eligibles from which to make certification to fill a vacancy in the position of assistant technical editor, $115 per month, in the Geological Survey, and similar vacancies as they may occur. A graduate in civil engineering with some practical experience in structural engineering, especially as regards concrete and reinforced concrete, will be preferred. Experience in writing on technical and engineering subjects is required. Applicants should apply to the United States Civil Service Commission, Washington, D. C., for application Form 1312.

The October number of the magazine "For California," published by The California Promotion Committee, is devoted to electric traction in the State. Few general readers are aware of the gigantic strides made recently in the production of electric power from California's mountain streams, or the extensive and highly diversified uses to which the current is being applied in manufacturing and transportation.

This greatly extended use of electricity as a cheap and perfect motive power has been made possible by the late improvements in transmission. It is now possible to send electric power, generated in some canyon well up in the Sierras, several hundred miles to the cities and valleys, and to the busy manufacturing area surrounding San Francisco Bay. Few of the daily users of the trolley cars in our various cities realize that the power which sends them skimming over the road is produced two or three hundred miles away, and sent hither on a wire from the mountains. Yet this is true of nearly every electric line in California.

An article is contributed by J. M. Eddy, on Stockton's electric railways; electric traction in Los Angeles county is outlined by H. S. Kneedler; William Robertson writes of electricity in the development of Fresno county; Clarence E. Edwords contributes a page on the use of electricity on farms; Joseph T. Brooks tells about electric traction in Santa Clara county and E. M. Van Frank writes in a similar vein on the electric traction of Sonoma County; there is an article on power from California mountain streams, by Walter J. Kenyon; an astonishing list of California power stations is given. Articles are contributed by staff writers on the "Development of Electric Traction of the State," "Electric Roads of San Bernardino County," and "Electric Traction in the Sacramento Valley." A page is given to Promotion Paragraphs." The frontispiece of this number shows a California mountain stream generating electricity.

The JOURNAL OF ELECTRICITY POWER AND GAS
WITH WHICH IS INCORPORATED
The Engineers' Architects' and Builders' News

Published Weekly by
THE TECHNICAL PUBLISHING COMPANY
SUCCESSORS TO
The Journal of Electricity Publishing Company
304 Atlas Building, San Francisco.

Yearly subscription, $2.50. Single copies, 10 cts. Back numbers prior to the current month, 25 cts. Foreign subscription, $4.00.
Subscriptions cannot be begun with back numbers.
Manuscripts submitted must be accompanied by postage to insure return.

Address all communications and make all remittances payable to The Technical Publishing Company.

Entry changed May 1, 1906, to "The Journal of Electricity, Power and Gas," with which is incorporated "The Engineers', Architects' and Builders' News."
Entered as second-class matter at the San Francisco Post Office, August 15, 1899.
Entered as "The Electrical Journal," July, 1895.
Entry changed to "The Journal of Electricity," September, 1895.

VOL. XIX OCTOBER 19, 1907 No. 16

EDITORIAL.

THE DEVELOPMENT OF PRIME MOVERS.

It is not many years that it has been necessary for the engineer to hesitate long in deciding the character of prime mover which should be selected for the generation of power. Where heat energy is to be converted into mechanical energy, until the last few years it was only necessary for the engineer to select the most adaptable type of reciprocating steam engine. Where water power was to be utilized a number of types of wheels were available, any one of which might be wisely selected, providing they were to be installed and operated under what are now considered "low" heads.

At the present time a selection of the best type of prime mover, either for the utilization of heat energy or water power is not so readily made. In almost every instance where the power is to be supplied in large units it is possible for the engineer to come to a decision only after considering the advantages and disadvantages of two or more decidedly different types. In the case of heat engines there is presented for his consideration the reciprocating steam engine, the high speed turbine and also the gas engine.

The development in the design and construction of each of the above types has in recent years been extraordinary. Notwithstanding this, however, it has been necessary for manufacturers to do a large amount of experimental work with the steam turbine as well as the gas engine in order to produce thoroughly reliable and efficient machines. With the steam turbine especially it has been necessary to develop materials which would meet the new requirements without any question of failure. Along with the increase in the size of units therefore there has been a decided improvement in the quality of materials used.

The steam turbine is especially adapted for driving large alternating current generators. The speed is so much greater than that possible with the steam engine of the same capacity that the floor space and weight of the turbine are but fractions of former requirements. But even in its present perfected form the steam turbine is not in every case the best steam unit to install. The load factor, extent of superheating and the degree of vacuum, all should be carefully considered where there is a question regarding the choice between the reciprocating engine and the steam turbine.

The economical production of power by gas engines using producer gas for fuel has proven a great success. From the standpoint of the size and weight of units the gas engine can not claim any of the merits that properly belong to the steam turbine, but it would seem from actual results obtained that with the gas engine the cost of fuel per unit of power delivered under favorable operating conditions is materially less than is possible with the steam turbine or the steam engine. For reliability and small cost of maintenance no heat engine has been able to displace the reciprocating steam engine.

In the largest units as built today we find with the steam engine wonderful development and improvement as a result of better design and increased efficiency of materials used. Water power units have also undergone great modifications. Within certain limits, the higher the head the more satisfactorily will the large water power unit operate. Probably in no other instance is the progress in the utilization of superior materials more effectively shown than in the construction and design of extremely high head impulse wheels.

The decidedly gratifying results obtained in the building of larger and more efficient prime movers can not be credited to one class of workers alone. The chemist, physicist, engineer, capitalist and skilled mechanic, each has done his share in developing and perfecting the various types in use today.

THE CONSEQUENCES OF NEGLECT.

Among the many annoyances daily experienced by the people of San Francisco at the present time, there are two that are worthy of especial consideration. The first is our unsatisfactory street railway service, and the second the totally inadequate supply of water for fire protection and domestic use. Such a condition of affairs does not exist, however, without a good and sufficient cause,

and in these two instances the cause is not hard to locate. To speak plainly, it must be said that the management of the two corporations which undertake to supply the public with transportation and water are in part to blame, but there are good reasons why they have not found it possible to meet the requirements more satisfactorily. It is also true that the people of San Francisco—merchants, bankers, professional men, skilled mechanics—all richly deserve the inadequate service at the present time given by its street railway and water companies. By consistently neglecting their civic duties the people of San Francisco in the past have made it at least unadvisable for either company to extend and improve their service. Whenever one of our best citizens is compelled to wait an hour or more for a street car and then wedge himself through a crowd in order to get a strap to hang on, he might with great propriety ponder deeply upon the fact that he is being only in part repaid for the many times he has neglected to vote and use his influence for political decency and the election of the proper city and county officials. He could probably recall many times when he had considered his own personal business affairs so important that he failed entirely to recollect that it was his duty to do all in his power at the primaries as well as the general elections, to select decent and responsible men for public office.

As a result of such self interest, the management of the city's affairs fell into the hands of criminals and boodlers, who, carrying out their natural instincts, proceeded to rob the public and the public service corporations and indirectly the individual property owners of the city.

We are reliably informed that there is a city not a thousand miles south of San Francisco—the distance is about half the above, we believe—that deservedly rejoices in a magnificent street railway system and an ample water supply and with a project well on foot to build one of the greatest water systems in the world. This city also rejoices in the fact that there exists a clean city government. The results to be found there are not merely accidental. A little investigation will show that the people of all classes protect themselves as well as the public service corporations by consistently doing their duty, and it is to be borne in mind that the primary rather than the general election is the best place to get rid of the undesirable candidates. The people of that city have in general done their duty and deserve and have unquestionably received excellent treatment at the hands of their public service corporations.

But a few weeks remain before the people of San Francisco will have a chance to redeem themselves. By electing the proper man for mayor and getting good, honorable, able citizens in public office, they can most effectively protect the personal and private rights of individuals and corporations. If San Francisco can have for a few years a broad, liberal administration of its affairs and effectively crush mob rule and lawlessness, it will not be necessary to ride on overcrowded street cars and beg in vain for a sufficient amount of pure, wholesome water. They can also hope to see our public buildings restored and our streets cleared of obstructions and filth.

PERSONAL.

George A. Hearn is electrical engineer for the Vallejo, Benicia and Napa Valley Railway Co., at Napa, California.

Mr. J. T. Marron, representing Trio Manufacturing Company, Rock Island, Ill., is in San Francisco on business.

Miles F. Steel, formerly of Chicago, has become associated with the Garden City Electric Cons. Co., in San Francisco.

H. Y. Hall is assistant electrical engineer with the Southern Pacific Company at San Francisco, working on power house and sub-station design.

Mr. J. W. McGill, representing Crescent Company, Valparaiso, left for Los Angeles last week. He has been in San Francisco on a business trip.

K. L. Curtiss has resigned as assistant professor of electrical engineering at Leland Stanford Jr., University, to join the staff of Westinghouse, Church, Kerr & Co., of New York City.

Mr. Louis Kemper, representing H. T. Paiste Company, Philadelphia, will be in San Francisco for the next two or three months explaining the merits of Paiste goods and particularly Le Marquis panel boxes.

Mr. Albert Carr has resigned as chief engineer of the United Railroads of San Francisco, to take the position of Superintendent of Construction on the water power developments of the Central Colorado Power Company at Colorado Springs.

G. A. Knoche, formerly with the Wesco Supply Company of St. Louis, has taken the management of the electrical department of Dunham, Carrigan & Hayden of San Francisco. Mr. Knoche is well known among the electrical trade throughout the Middle West.

Mr. L. M. Scofield, for the past two years vice-president and chief engineer of the Scofield Construction Company, has become associated with Daniels & Dillman, Monadnock Building, San Francisco, who are prepared to take over work of any magnitude in railroad, hydraulic power and supply and sanitary engineering.

Mr. James C. McPherson, assistant superintendent of the Pacific Electric Railway at Pasadena, Cal., has been appointed superintendent in charge of interurban traffic with headquarters at Los Angeles. Mr. J. F. Turner, superintendent of the Mt. Lowe division, will succeed Mr. McPherson as assistant superintendent, having under his jurisdiction both the northern and Mt. Lowe divisions.

ERRATA.

Insert "This line, completely installed, cost one and one-half" at top of first column, page 274, of our issue of September 28th, in the article entitled "A Recent High Pressure Installation," by E. C. Jones.

Transpose "some may be fast, some slow, etc. It is bad for a gas" from the first to the second column of page 294, issue of October 5th, in article entitled "Practical Suggestions from a Practical Man," by Stephen A. Byrne. EDITOR.

LOCAL STOCKS AND BONDS

Furnished by Courtesy San Francisco Stock and Bond Exchange.

Outstanding	INTEREST	MISCELLANEOUS BONDS	OCT. 10		OCT. 11		OCT. 12		OCT. 14		OCT. 15		OCT. 16	
			Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked
1,532,000	F & A	Associated Oil Co. 5%		80		80		80		80		80	75	82½
2,250,000	M & S	Bay Counties Power Co. 5%	92¾		92¾		92¾		92¾		92¾		92¾	
1,000,000	F & A	Cal. Central Gas & El. 5%		100		100		100		100		100		100
9,600,000	M & S	Cal. Gas & El. Gen. M. & C. T. 5%	69¾	70		70	69¾	70	69¾			70	69	70
900,000	J & J	California St. Cable Co. 5%		102½		102½		102½		102½		102½		102½
2,000,000	J & J	Contra Costa Water Co. 5%		100½		100½		100¾		100¾		100½		100½
1,000,000	J & J	do do Gen. Mtg. 5%		90		91		91		90		90	85	91
623,000	F M A N	Edison Light & Power 6%	109	112		112		112		112		112		112
650,000	M & S	Ferries & Cliff Ho. Ry. 6%												
671,000	A & O	Geary St. Ry. 5%	50	80	50	80	50	80	50	80	50	80	50	80
610,000	M & N	Honolulu R. T. & L. Co. 6%	105		105		105		105		105		105	
300,000	A & O	Lake Tahoe Ry. & T. Co. 5%												
500,000	J & J	Los Angeles Elec. Co. 5%		100		100		100		100		100		100
1,300,000	J & J	Los Angeles Gas & Elec. Co. 5%		100		100		100		100		100		100
5,000,000	A & O	Los Angeles Ry. 5%		108		108		108		107½	107¼	107¾	107½	108
1,000,000	A & O	Los Angeles Lighting Gd. 5%		100½	100	103½	100		100		100		100	
1,500,000	A & O	Los Angeles Pac. R. R., 1st Con. Mtg. 5%	100½		100½			101		101		101		101
3,030,000	M & S	L. A. Pac. R. R. of Cal. 5%		99		99		99		99		99		99
3,000,000	J & J	Market Street Cab'e 6%	106	107		107	106	107¼	106	107½		107		107
5,141,000	M & S	do Ry., 1st Cons. Mtg. 5%		102		102		102		102		102		102
100,000	A & O	Mill Valley & Mt Tamalpais S.Ry. 5%	103		103		103		103		103		103	
4,751,000	A & O	Northern Ry. Co. of (Cal.) 5%	110		110		110			111		110½		110¼
1,498,000	J & J	North Pacific Coast R. R. 5%		101½		101½		101½		101½		102		102
1,074,000	J & D	Northern Cal. Railway 5%	105		105		105		105		105		105	
980,000	J & D	Northern Cal. Power Co. 5%		95		95		95		95		100		100
6,000,000	A & O	Northern Electric Co. 5%												
1,000,000	M & S	Oakland Gas Light and H. 5%	101½	105	101½	105	101½	105	101½	105	101½	105	101½	105
1,374,000	J & J	Oakland Transit Co. 6%	109	110		110		110		110		110	108½	110
1,600,000	J & J	Oakland Transit 5%	101½		101½		101½		101½		101½		101½	
1,326,000	J & J	Oakland Transit Con. 5%		102½		102½		102½		102½		102½		102
7,000,000	J & J	Oakland Traction Con. 5%		99		99		99		99		99		99
1,500,000	J & J	Oakland Water Co. gtd. 5%		95		95		95		95		95		95
2,000,000	A & O	Omnibus Cable Ry. 6%		112		111		111		111		111		111
1,149,000	S D M J	Pacific Gas Imp. 4%		92½		92½		92½		92½		92½		92½
8,494,000	J & J	Pacific Electric Ry. Co. 5%		103					100¾		100¾		101	
4,491,000	J & J	Pacific Light & Power Co. 5%		98		98		98		98		98		98
3,000,000	J & J	Pacific Tel. & Tel. Co. 5%		102½		102½		102½		102½		102½		102½
350,000	J & J	Park & Cliff House Ry. 6%		104		104		104		104		104		104
250,000	J & J	Park & Ocean R. R. 6%		104¼		104¼		104¼		104¼		104¼		104¼
700,000	M & S	Powell Street Railway 6%												
2,500,000	M & N	Sacramento Elec. Gas & Ry. 5%		101	95	98	95	97		97½	94		94	
6,000,000	A & O	S. F. & S. J. Valley Ry. 5%		111		111		111		111		111		111
3,000,000	J & J	S. P., Oak. & San Jose Ry. 5%	103½		103½		103½		103½			104		104
1,500,000	J & J	do do 2d Mtg. 5%												
1,500,000	A & O	S. J. & S. Clara Co. R. R. 4½%												
642,000	A & O	Sierra Ry. of Cal. 6%	105	110	105	110	100		100		100		102	
6,000,000	J & J	S. P. R. R. of Arizona 6% (1909)	101½		101½			102	101½	101½		101½	101	101½
4,000,000	J & J	do do do (1910)	101¾		101¾	102¼	101¾	102¼	101¾	102¼	101½		102	
5,116,000	A & O	S. P. R. R. of Cal. 6% (1912)	105		105		105		105		105		105	
4,127,500	M & N	S. P. R. R. of Cal., 1st c. gtd. 5%	112½		112½		112½		112½		112½		112½	
3,533,000	A & O	S. P. Branch Ry. of Cal., 6%		122¼		123		122½	121	122¾		122½		122½
81,178,000	J & J	S. P. R. R. Co., 1st Ref'd'g. 4%	89	89½	89½		89½		89⅛		89½		88½	90
17,500,000	J & D	Spring Valley Water Co. Gen. Mtg. 4%	85	87	85		85		86		87¾			89
300,000	M & S	Stockton Gas & Elec. Co. 6%		105		105		105		105		105		105
2,000,000	J & J	United Gas & Elec. Co. 5%												
20,000,000	A & O	United R. R. of S. F. 4%		67¼		67½		67½	65	67		66	61½	64
2,500,000	M & N	Valleys Counties Power Co. 5%		95		95		95		95		95		95
		Water Stocks.												
		Contra Costa		62		62		62		62		62		62
6,000	Quarterly	Marin County	45		45		45		45		45		45	
280,000		Spring Valley Water Co	20⅛	20½	20	20½	20	20½	20		19⅜		19¾	20½
		Gas and Electric Stocks.												
37,500		Martel Power Co												
9,340		Mutual Electric Light Co. (Ctfs.)	4¾		4¾		4¾		4⅝		4⅝		4⅝	
37,336		do (Extended Ctfs.)	13⅜		13⅜		14⅛	14⅜	9	9¼	9	9⅜	9	9⅜
40,000	Monthly	Pacific Lighting Co	65		65		65		65		65		65	
12,000		Stockton Gas & Elec. Co	52		52		52		52		52		52	
		Street Railroad Stocks.												
10,000		California		135		135		135		135		135		135
10,000		Geary		35		35		35		35		35		35
10,000		Presidio		25		25		25		25		25		25
	Semi-an.	Associated Oil Co	28	28½	28	28¼	28		28	28½	27¾	28¼		28¼
1,625	Quarterly	Mill Valley & Mt. Tamalpais S. Ry.		110	100		100		105		105		105	
180,000	Quarterly	Pac. Tel. & Tel. Co. (Pfd.)		81	79¾	80½	79¾	80½		80½		80½		80½
180,000		Pac. Tel. & Tel. Co. (Common)	10		10⅛		10½		10	11		11	10	11

Unlisted Securities

750,000	A & O	Bay Counties Power Co. 6%	97		97		97		97		97		97	
745,000	M & S	Blue Lakes Water Co. 6%												
2,000,000	A & O	California Northwestern Ry. 5%		106		106		106		106		106		106
160,000	J A J O	Marin County Water 5%		100		100		100		100		100		100
600,000	J & J	Riedon Iron Works 5%		100		100		100		100		100		100
500,000	M & S	S. F. Dry Dock 5%	100	109	100	109	100	109	100	109	100	109	100	109
8,000,000	M & N	S. P. Gas & Electric 4½%		95		95		95		95		95		95
3,926,000	J & J	S. P. & North Pacific Ry. 5%		104		104		104		104		104		104
5,500,000	J & J	South Pacific Coast Ry. 4%		90		90		90		90		90		90
		Standard Electric Co. 5%		82½		82½		82½		82½		82½		80
		do do Gtd. 5%		85		85		85		85		85		85
750,000	J & J	Sunset Tel. & Tel. Co. 6%												
2,250,000	A & O	Sunset Tel. & Tel. Co. 5%		103½		103½		103½		103½		103½		103½
1,000,000	M & N	Sutter Street Railway 5%		103		103		103		103		103		103
		Stocks.												
50,000	Monthly	Gas Consumers' Association		20		20		20		20		20		18
100,000	Monthly	Northern Cal. Power Co	24¾	25	24¾	25		24½		24½		24½		24½
		Pac. Gas & Elec. (Pfd.)	37½	44		45		45		45		45		45
		Santa Cruz Port. Cement	40	50	40	50		47½		47½		47½		47½
		Standard Port. Cement (New)		50		50		50		50		50		50
50,000	Monthly	Truckee Electric Co	14		14		14		14		14		14	

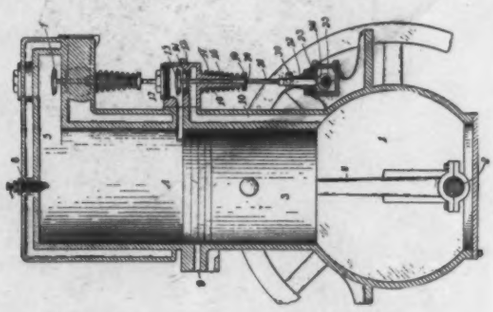
PATENTS

Electric, Gas and Water.

Specially reported for the Journal of Electricity, Power and Gas.

EXPLOSIVE-ENGINE. 867,279. Martin C. Kessler, Denver, Colo.

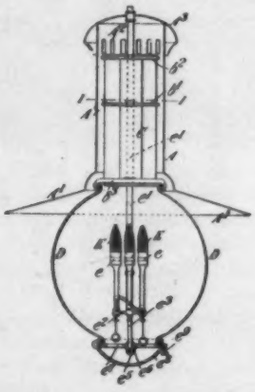
In an engine in which air is compressed by the piston in the crank-case, means for discharging the compressed air in the crank-case into the cylinder with each alternate revolution of the crank-shaft, a valve which normally shuts



off the air supply with the remaining revolutions of the crank-shaft, and means within the control of the operator for causing the discharge of the compressed air into the cylinder with each inward stroke of the piston.

INCANDESCENT GAS-LAMP. 867,268. Thorne S. Haight, Manchester, England, assignor to Clark Way Harrison, Glasgow, Mo.

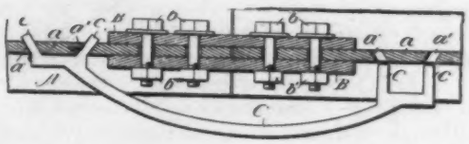
In an incandescent gas lamp, the combination with the burners and the mantles; of a surrounding transparant casing, a plurality of draft screens for the mantles, means for



enabling simultaneous movement of draft screens to and from their protecting position relatively to mantles, and means for enabling screens to be independently manipulated while in their protecting position for the purpose specified.

RAIL-BOND. 867,406. Lewis T. Pates, Upper Alton, Illinois.

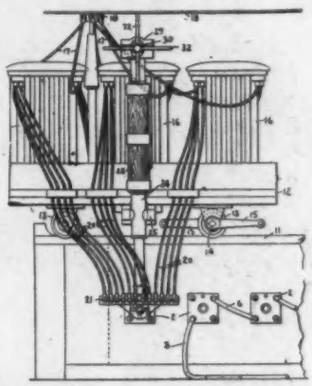
The combination with rail ends, fish plates, bolts and nuts; the plates and rail webs having pairs of registering inclined apertures at opposite sides of the bolts, of a rail-



bond having pairs of nut engaging jaws at its ends and a prong projecting from every jaw and adapted to be forced into the apertures and bent apart.

ELECTRIC FURNACE. 867,519. John T. Marshall, Metuchen, N. J., assignor to General Electric Company.

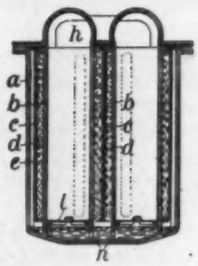
An electric furnace comprising a box-like structure, a filling of loose refractory material, carbon tubes extending across box below the surface of the filling, metal sockets in



the walls of the box for holding the ends of tubes, a carriage movable along the top of box, levers pivoted on carriage and carrying terminals adapted to engage with the sockets, a transformer on carriage having its secondary coils connected with terminals, and a screw shaft uniting levers for simultaneously operating them.

SEPARATOR. 867,240. Karl Brunner and Otto Bühring, Mannheim, Germany.

An apparatus for separating oil from steam consisting in the combination of a chamber, through which the steam passes, a pipe or pipes within chamber around which the



steam passes, a perforated partition or partitions arranged within chamber and encircling pipe or pipes, and flanges integrally provided on the internal periphery of chamber which serves to divide the space between the perforated partition and the casing of the chamber.

INDUSTRIAL

IRON-CLAD PORTABLE INSTRUMENTS.

The General Electric Company, Schenectady, N. Y., is now offering a new line of iron-clad portable instruments of a quality that will meet the requirements of the most exacting service.

The volt meters and watt meters are constructed on the direct reading dynamo meter principle, while in the ammeters the Thomson inclined coil principle is applied. Mechanically these instruments are substantial in construction, with light weight moving element, not susceptible to injury in transportation. The coils of these Type P-3 instruments are entirely surrounded by a laminated iron shield which thoroughly protects from the influence of external magnetic fields. One of the severest tests of the reliability of these instruments when used for laboratory or general testing purposes is their ability to give accurate indications when used in the vicinity of external magnetic fields.

The instruments excel in mechanical construction, are neat in appearance and very substantial. They are contained in wood carrying cases provided with hinged cover and snap lock. By the removal of the internal moulded cover and three additional screws, the entire mechanism can be taken from the case. The binding posts are brought out at the top of the instrument and are provided with suitable thumb-screws for securing the leads which connect the instrument to external circuit.

The Type P-3 instruments may be used on circuits of any frequency, wave form or power factor, without appreciable error. The volt meter and watt meter may be used interchangeably on direct or alternating current. The ammeter, although primarily an alternating current instrument, may also be used on direct current circuits by taking reverse readings.

The scales of Type P-3 instruments subtend an arc of approximately 90 degrees and are very legible, as may be noted by reference to the accompanying illustration.

As portable instruments must first of all be accurate and capable of retaining this accuracy in service, especial attention in design details has been devoted to this feature. Careful attention has been given to the construction of the jewels and pivots, as these have great influence upon the continual accuracy of indicating instruments. The pivots are made from the best grade of steel, specially hardened and highly polished, and are suspended in high grade sapphire jewels which are practically indestructible. The pointer fluctuations are damped by means of Foucoult currents set up in a thin aluminum segment which is attached to the shaft, and oscillates with each movement of the pointer in the field of two astatically arranged permanent magnets. The weight of this segment balances the

weight of the pointer, thereby maintaining equilibrium without extra counter weights.

Type P-3 ammeters are made self contained in capacities up to and including 30 amperes; volt meters up to and including 750 volts, and single phase watt meters in capacities up to and including 30 amperes and 750 volts.

PRESSURE PIPE LINES, STANISLAUS POWER PROJECT.

Following are the general details of the pressure pipe lines in connection with the hydro-electric installation on the Stanislaus River for the Stanislaus Electric Power Company: There are two pressure pipe lines leading from the fore-bay to the water wheels in power house, each pressure line being approximately 3100 feet in length, the total fall in the length of each pipe line being 1500 feet. The upper half of each pressure line is 49 inches in diameter and the lower half of each line 40 inches in diameter. The pipe lines are of riveted steel throughout and the pipes range in thickness from 5/16 inch to 1 inch. All pipes made of steel plates ½ inch in thickness and heavier are made up with butt-strapped joints, triple riveted on each side of the longitudinal seams and double riveted on each side of the round-about or circular seams. The two pressure lines are connected just outside of the power house wall by means of a header connection about 70 feet in length.

Connecting to the up-stream end of the header, immediately outside of the power house wall, is a third pipe line, known as the mine supply line, having an average diameter of 36 inches, which will deliver water across the river and up the hill on the opposite side from the power house to an elevation of 1500 feet. This pipe line is about 5400 feet in length and is a continuous riveted pipe made up of steel plates, ranging from ¼ to ⅞ of an inch in thickness.

The mine line is carried across the river from the power house on three riveted steel bridge spans, of ap-

proximately 120 feet each. The details of construction of the mine line are similar in all respects to the details of construction for the pressure pipe lines, the maximum working head on the lower end of the mine line being 1500 feet.

The contract for this entire equipment, together with fittings, such as air valves, header pipes, manholes, etc., was placed with the Risdon Iron & Locomotive Works of San Francisco, and the installation of the pressure pipe lines is already under way.

The total weight of pipe for the three lines is approximately 3000 tons. The pipe is being shipped from the works of the Risdon Iron Works in sections of from 24 feet to 30 feet each. Each section of the 40 inch pipe, 1 inch thickness, 24 feet in length, weighs about nine tons.

The pipes are all delivered by rail to Angels Camp, Calaveras County, and hauled from there some eighteen miles to the site of the power house on the Stanislaus River. From the storage ground near the power house the pipe is hauled up the mountain side by means of a tram-way, which is operated by a large hoisting engine placed at the top of the hill near the fore-bay. The Risdon Works have established a large camp near the site of the power house and the work of installation will be carried on through the winter.

WELSBACH EXHIBIT AT PACIFIC COAST GAS ASSOCIATION CONVENTION.

The exhibit of gas appliances at the Gas Association meeting in Santa Cruz was one of the features of the meeting and attracted considerable attention. We are publishing herewith a photograph of the exhibit of the Welsbach Company of the "Reflex" inverted gas light, which is the highest type of burner yet devised for burning of gas, using an incandescent mantle. It is most efficient and satisfactory and affords an opportunity for decoration not heretofore shown in any style of a light. There is no question but what this type of a burner, which has attracted a great deal of attention in the lighting world, is the coming thing, as the exhibit of the Welsbach Company at Santa Cruz unquestionably impressed everyone with this truth. The most important step in the development of incandescent gas lighting in recent years is the successful construction of an inverted mantle burner. The first experimenters in the incandescent gas lighting field attempted to construct an inverted burner, but the mechanical difficulties in the way of producing a Bunsen burner which would work in the inverted position with the variable gas conditions existing were a problem which they were not able to solve. The air supply for the Bunsen tube must be protected so as not to draw in the products of combustion; the burner must be so constructed as not to flash back when lighted, or after burning some time. The flashing back is overcome by the use of an automatic gauze or thermostat, which is closed when the lamp is cold and opens up as it is heated. It is made by rolling together two pieces of metal which have different co-efficients of expansion. Brass expands more than iron when heated and causes the curved fingers of the thermostat to straighten out and lie against the walls of the Bunsen tube. On cooling, the brass contracts more than the iron, and the fingers resume their curved position, forming a slitted cone.

The exhibit at Santa Cruz was in charge of R. J. Thompson, the San Francisco manager. It included illustrations of the various processes and materials of construction, showing the care used. This included the knitted fabric before and after saturation, a display of the various rare earths and a beautiful showing of glassware.

NEWS NOTES

TELEPHONES.

The new long distance telephone line between Spokane and St. Joe, Ida., owned by the Interstate Telephone Company, has been opened. The line is 140 miles in length, and built with 30-foot poles and heavy wire.

E. E. Crandell, of the Interstate Telephone Company, has completed arrangements to put in a system at Kendrick, Ida. He will raze the old poles and replace them with 35-foot poles, and put in a metallic circuit system. Most of the business houses and many private houses are equipped with instruments.

The Spokane & Northern Telegraph Company has issued a general order to all operators along its line to refuse to take telegrams over the telephone for transmission over the wires. Two reasons are given: The telephone will cause mistakes in spelling and pronunciation, and also involves the trouble and expense of keeping books of accounts and making collections.

The Interstate Telephone Company has opened a second telephone line to St. Maries, Ida., east of Spokane, the service being by way of Mount Hope and Rockford. The two new circuits of the company between St. Maries and St. Joe have been completed, and the construction of 20 miles of new line up the St. Joe River, along the Chicago, Milwaukee & St. Paul Railway Company's new line, and will also extend the line to Harrison.

The Cheney telephone exchange has been sold by W. T. Du Bois to the people of Cheney, Wash., southwest of Spokane. When Mr. Du Bois bought the exchange a short time ago, he was given a franchise to operate it for years. There has been much complaint on account of the poor service given by the Pacific States Company, and when the Commercial Club began an agitation for better service the company expressed a desire not wishing to make the improvements demanded by the people. After granting a 15-cent rate over its long distance line into Spokane it turned its interests over to local capital, which will improve the service.

W. W. Hindman, secretary of the Home Telephone Company, of which he is also a director, gave out this statement a few days ago:

"Spokane will have one of the model automatic telephone systems of the country. The construction will be the latest, and it is aimed to make the plant the best and most complete in the world. The plant in Spokane will cost about double the amount the management promised the people would be paid out to install the local exchange. In other words, the cost of the equipment will represent an outlay of $1,400,000. The plant will be completed and in operation in January, 1908, and indications are that we shall begin business here with at least 8,000 subscribers. We are making no special efforts to secure subscribers now, as experience has shown us that people will apply for instruments as rapidly as they can be accommodated after the exchange is opened and the advantages of a modern, up-to-date automatic system are shown."

The Twisp-Barron, Twisp-Conconully and Twisp, Chelan and Wenatchee telephone lines are projects growing out of the visit of Forest Supervisor George W. Milham to Twisp, Wash., northwest of Spokane. The Twisp-Barron line extends 45 miles to the north from Twisp, passing through Winthrop, Mazama, Robinson and to Barron in the Slate Creek mining district. The Twisp-Conconully line traverses 40 miles to the eastward over the old Loop Loop road. The Twisp-Chelan line covers 28 miles to the southwest over the Gold Creek trail, and the Wenatchee extension adds 70 miles more. Mr. Milham has made a proposition that the department will furnish all the material for the construction of the lines and string the wires if the people will prepare, deliver and place the poles in position, and cut out the right of way. There is to be no charge for the use of the service. Instruments will be placed at the various points along the lines. Barron, Robinson, Winthrop and Mazama are now without telephonic communication with the outside world. The property owners and miners of the Slate Creek district must go 45 miles to Twisp to get a message started, and then it is frequently impossible to send the messages. The service provided by the Pacific States Telephone Company censured, condemned and denounced in language forcible and picturesque by the county press, and anathematized by the business men.

Spokane, Wash.—When Charles Sumner, president of the Home Telephone Company, reaches Spokane from the East, early in November, it is given out that a contract will be entered into with the Interstate Telephone Company for local and long distance connections, thus furnishing lively competition for the Pacific Telephone & Telegraph Company. The Interstate lines now reach a large number of points in the Spokane country, an area of 150,000 square miles in Eastern Washington, Northern Idaho, Northeastern Oregon, Southeastern British Columbia, and Western Montana, and as soon as the lines now under construction and projected are completed the company will cover the bulk of the Pacific's field in this Inland Empire of the Northwest. The Home company has long distance connections between Everett, Wash., and every town and city in Oregon as far as Portland. The line will be extended from Everett to Spokane, but the company contemplates no incursion into the local field beyond the business in Spokane itself. For connections in the Spokane country it will depend upon its traffic agreement with the Interstate company. The Home company's long distance lines will permit the Interstate company to reach Puget Sound and Pacific Coast points, while the lines of the Interstate company will give the Home company entrance into the Coeur d'Alene mining district and the Palouse and Big Bend wheat belts, which could only be reached at large expense by the Home company if it were compelled to string its own wires into the territory.

WATERWORKS.

Tucson, Ariz.—The Council has decided to extend the time for submitting bids for the new waterworks system until November 4, in order to have the work advertised in engineering journals.

Phoenix, Ariz.—Superintendent Creighton, of the City Water Department, is sending out advertisements to principal engineering publications, asking for bids to be submitted for installing improvements in the city water system, as per plans of Engineer Howard Reed, of the Reclamation Service. All bids must be submitted by November 15th.

Santa Cruz, Cal.—H. A. Van Torchiana, one of the leading attorneys of Santa Cruz, has filed suit against William A. Dingee, the cement king, involving the question of riparian rights and his right to the water known as Majors Creek, flowing through property within the city limits. Attorney Van Torchiana claims that the stream has a fall of sixty feet, and is therefore worth thousands of dollars in value. He also claims that the defendant is to divert the water of this stream and carry it to land to be used for his own purpose. The four-inch pipe threatens to divert the water of the stream and carry it to lands non-riparian. Van Torchiana asks that Dingee be enjoined from interfering with riparian rights.

San Francisco.—The declaratory ordinance setting forth that a bond issue was advisable and necessary to secure the city a high-pressure fire protection system, in its amended form, as introduced before the Board of Supervisors, limits the use of the system to fire purposes only. In asking that the proposed ordinance go over one week for further consideration, Supervisor Sullivan pointed out that the immense reservoirs of fresh water which would be installed upon Twin Peaks and filled from artesian wells in the Mission, might very well be drawn upon by the city, in ordinary times, for sewer-flushing and street-sprinkling purposes, and he inquired why the city should deprive itself of this advantage. These features had been stricken from the original draft in accordance with an undefined impression that the National Board of Underwriters objected to their incorporation. Chairman Faymonville, of the fire committee, said he could very well imagine why the underwriters should object to the system being used by any other than the fire department, but could see no objection to the use of water from the high-pressure mains under precautions which would insure keeping the reservoirs filled and the pressure sufficient. The ordinance was returned to the fire committee, to clear up these points.

TRANSPORTATION.

San Diego, Cal.—The Council has adopted Ordinance 3029, granting a franchise to the Point Loma Electric Railway Co. to construct and operate lines on certain streets in San Diego.

Napa, Cal.—Manager L. J. Perry, of the San Francisco, Vallejo and Napa Valley electric road, has received word that the big shipment of steel rails, which will be used to complete the up-valley extension from Oakville to St. Helena, is now on the road, and should reach its destination not later than the middle of October. Everything is in readiness for the laying of the rails, and after they arrive the road will be finished in a few weeks. It is practically certain that the line will be in operation between this city and the up-valley town by the first of the year.

Oakland, Cal.—Application has been made to the Board of Supervisors for a franchise to operate an electric road through Elmhurst, by Ira A. Miller, secretary of the Wickham, Havens Co. The line applied for will be a feeder to the Oakland Traction Consolidated's main line from Oakland to Hayward, and will run through a district that has recently grown greatly in population. As outlined in the application for the franchise, the new line will leave the county road, on which the main line runs, at Grand Avenue, and will run along the latter thoroughfare to Derby Street, crossing the boulevard known as the Foothill Road. The application was referred to committee.

Los Angeles, Cal.—Slowly, but surely, the Huntington trolley system is crowding the local steam passenger lines out of the field. As long as two years ago the Santa Fe commenced taking off trains, but the Southern Pacific held out until October 1st, when it abandoned its passenger traffic to and from Whittier, leaving that town without a railroad, so far as carrying people is concerned. This branch line has been in operation eighteen years, most of the time several trains being run each way daily, but for many months two trains daily have been sufficient, and lately there were often less than half a dozen passengers. The Pacific Electric provides shorter and quicker service. It is understood that the Southern Pacific will withdraw trains now running to various other local points, including even the beaches. The Salt Lake operates only enough trains to Tropico and Pasadena to hold its franchises. Steam freight traffic remains heavy to all points, despite electric competition, and will be continued.

ILLUMINATION.

Redlands, Cal.—A company has been organized by Clarence A. Watson, to be called the Watson Construction Co., with capital stock of $50,000. The object is to build gas plants, the Baker Iron Works to do the building.

Redwood City, Cal.—The bid of W. J. Martin for a franchise to maintain and operate an electric light system in the First Township, that was laid over at the last meeting of the Supervisors, was brought up by Attorney Hall Ross, and the clerk was instructed to re-advertise for bids.

San Francisco, Cal.—Supervisor Sachs and Light Inspector Byrne, after an all-day tour of investigation, reported to the lighting committee, and the committee ordered the installation of about sixty arc and sixty gas lamps, distributed mainly in the Mission, Ashbury Heights and Sunset districts.

Oakland, Cal.—Gas lights on ornamental poles, round, opalescent globes and Welsbach burners, may shortly supersede electric arc lights in the residential districts of Oakland. Mayor Mott has announced that he will, in the near future, call a meeting of the lights committee of the City Council, for the purpose of considering the change. The plan is to have three such lights to the block, one on each corner and one in the middle of the block, on the opposite side of the street from the corner lights. The Mayor advocates the change on the ground that it is more ornamental, will light the streets better by reason of being closer together and shedding light beneath the branches of trees, and will not cost any more than the arc lights.

POWER AND LIGHT.

Meadows, Wash.—Meadows will soon be lighted by electricity, as the dynamos and all other necessary apparatus were received by B. A. Chisholm, and will be installed in a few days, when Harry H. Schieler, the well-known electrician, arrives from Salt Lake.

Spokane.—Work will soon start on the dam of the Big Bend Water Power Company on the Spokane River, 28 miles below Spokane. It is the intention of this company to build a light plant to Spokane and also a power plant to furnish power for mines of the Coeur d'Alene district.

Sandpoint, Idaho.—The Pend d'Oreille Iron Works of this city has commenced construction on its gas plant, the franchise for which was granted by the council some time ago. The company has a force of men and teams engaged excavating, and will push work along as rapidly as possible.

Spokane.—The Board of County Commissioners yesterday granted to A. M. Wood and R. H. Long a franchise for an electric lighting system in Deer Park. They took under advisement the application of Louis Olsen for a franchise for the establishment of a telephone system in the same place. Fred. Wendt asked the commissioners for a water works franchise in Irvington Heights, and it was taken under advisement.

Edmonds, Wash.—Fred E. Sander, of the Seattle & Everett interurban, was notified by the Edmonds Chamber of Commerce that that town had succeeded in raising a subsidy for bringing in the road. The committee succeeded in securing $20,000 for the "south" route and $12,000 for the "east" route. Mr. Sander notified the chamber that he would immediately put his engineers in the field, and upon their report would decide which route he would accept.

Klamath Falls, Ore.—C. S. and R. S. Moore, who are constructing a large power plant on the west side of Link River, within the city limits, are experiencing trouble in their excavating on account of the heavy flow of water. There are numerous springs in that locality, and it is supposed that the source of supply has been tapped. A large pump is now being used, operated by a gasoline engine. Moore Bros. contemplate installing an up-to-date electric plant and a franchise has already been asked for in the town of Merrill. They will have power to rent, and are building for the future, for with the advent of the railroad there will be manufacturing establishments of various kinds located here.

St. Helens, Ore.—The St. Helens, Ore., Mill & Power Company, doing business in Skamnia County, Wash., has made application to the federal court for an injunction restraining Henry Waldo Coe of Portland from interfering with the plaintiff's operations. The complaint states that the plaintiff purchased the right to use 20,000 cubic feet of water from the middle branch of the Toutle River for a power plant. It is alleged that after the work had been in progress some time the defendant began the construction of a dam across to raise the water in Spirit Lake, and prevented the plaintiff from the use of the water right. Workmen employed by the rival companies are said to have clashed several times.

OIL.

Coalinga, Cal.—The Coalinga Oil and Transportation Co. has let the contract for the building of the eight buildings on the pipe line stations between Coalinga and Monterey, to J. M. Robertson. These buildings are found necessary to accommodate the growing business of the company.

Bakersfield, Cal.—According to a rumor which has been current among local oil men, a well-known independent company of the Kern River fields has been offered sixty-five cents a barrel for a five-year contract, by the Standard Oil Co. Neither confirmation nor denial of the report can be gained, but it is said that the offer has been taken under advisement by the company, and that a contract on these terms may be signed within a few days. According to many oil men, the price would be by no means unexpected, and it is considered that the contract for five years at sixty-five cents would be rather less advantageous to the producer than at one year for fifty cents. W. H. Hill, of Barlow & Hill, even states that he expects dollar oil within the next six months. Meanwhile, there is much gossip over the graduated price of from thirty to forty-five cents, given in Blodget's contract with the Salt Lake, as the selling price for the five-year contract. The charge has been openly made that the price given in the recorded contract is not the true one, but that it in reality was a much higher figure. It is said that offers, apparently more advantageous than the one accepted, according to contract figures, have previously been rejected, and it is hinted that the real contract price is ten cents higher each year than that shown.

INCORPORATIONS.

Santa Rosa, Cal.—E. C. Amedee, A. J. Brown and W. F. Ansell, have filed articles of incorporation for the Napa and Lakeport Railway Co., with a capital stock of $2,000,000.

Visalia, Cal.—Articles of incorporation have been filed by the Wallace Ranch Water Co., with a capital stock of $10,000, by Cora Wallace, C. G. Lamberson and J. H. Morton.

Fresno, Cal.—The Eyry Oil Co. has been incorporated with a capital stock of $100,000 by J. E. and R. H. McCreary, of Hanford, W. P. Kerr, Thos. Clark and H. R. Crozier, of Coalinga.

San Francisco, Cal.—The Dudley Oil Co. has been incorporated with a capital stock of $10,000. The Directors are J. H. Sievers, Philip Kiefer, Wm. Kahn, J. B. Poland and J. M. Turner.

Los Angeles, Cal.—The Euclid Oil Co., with a capital stock of $350,000, has been incorporated by M. V. McQuigg and T. H. Noxon of Ontario, O. Z. Hubbell and A. J. Wallace of Los Angeles, and F. S. Wallace of Pasadena.

TRANSMISSION.

St. Helena, Cal.—Dr. G. S. Conner has received a letter from the manager of the Snow Mountain Water & Power Co., saying that he expects work to be commenced on the Napa Valley line within ten days.

Nevada City, Cal.—Not until next spring will the big power plant on Deer Creek be finished, though it was expected that it would be in running order early in December. Lack of water pipe is the cause of the delay in perfecting the work. Only 900 of the 6,400 feet of pipe required have been delivered, and the remainder cannot be secured until next spring. Work has been abandoned for the season.

Eureka, Cal.—Superintendent H. L. Jackman, of the North Mountain Power Co., has secured additional water power in Trinity County by another high head, located on Canyon Creek, a tributary to the main Trinity River. The North Mountain Co. is now building another big plant near this new head, which has a fall of 1,200 feet, and is located sixteen miles above the present power station at Junction City. The fall was procured September 1st. The new plant will, when completed, have a minimum horsepower of 14,000. Superintendent Jackson says that the company's line will tap a reservoir containing 30,000,000 cubic feet of water, in turn connected with a chain of reservoirs containing 200,000,000 cubic feet of water.

San Francisco, Cal.—The last session of the special joint "Poles and Wires" Committee of the Board, has been held. President Britton, of the gas company, made a plea that this was no time to put extra burdens on the public utility corporations, and that the proposed substitute ordinance to the one introduced by Supervisor Sullivan was itself objectionable, as it virtually did not increase the underground area already voluntarily created by his and other companies, but would serve to favor new companies entering the field by giving them three years to place underground construction in this district. The matter was taken under advisement and the hearing closed. Supervisor Sullivan will present to the committee a revised ordinance granting more time to the companies than the eighteen months proposed in his original draft, and demanding a less extensive area to be denuded of poles and wires.

FINANCIAL.

San Francisco, Cal.—At a recent meeting of the Board of Supervisors a bill was passed appropriating $15,000 to build a central fire-alarm station.

San Francisco, Cal.—At a meeting of the Directors of the Ocean Shore Railway Co., held on October 4th, an assessment of $5 per share, payable November 21st, was levied.

Albuquerque, N. M.—The defeat of the municipal water bonds will probably result in the introduction of a resolution in the City Council for naming a commission of business men to investigate the matter to ascertain if it is practical to own a municipal waterworks plant.

Lakeport, Cal.—This city has voted to issue bonds for the sum of $15,000 for the extension of the water system. The bonds were bitterly fought, but carried by more than the necessary two-thirds' majority. There were 138 votes cast in favor of the bonding proposition, and 57 against it.

San Francisco, Cal.—An agreement has been recorded between the United Railroads and the St. Louis Car Company by which the title to 100 coaches shipped to the local traction company remains with the St. Louis corporation until a promissory note for $116,457, given by the company, shall be paid. The cars are part of a shipment of 250 recently sent to the Coast.

Los Angeles, Cal.—Bids were submitted to the Board of Public Works for engraving the $23,000,000 issue of the Los Angeles Aqueduct bonds, by the United States Mortgage and Trust Co., New York Bank Note Co., Los Angeles Trust Co., Security Bank Note Co., E. A. Wright Bank Note Co., Columbia Trust Co., National Bank Note Co. of Philadelphia, and W. P. Jeffries Co. of Los Angeles.

Lodi, Cal.—The City Trustees are considering the question of submitting to the voters at the next municipal election the proposition of bonding the city in the amount of $150,000, for the purpose of establishing a sewerage system and to take over the electric light plant and waterworks. A mass meeting will be called in the near future, when costs will be submitted and advantages in municipal ownership of public utilities explained.

TELEPHONES.

Mullan, Ida.—This city will have an exchange of the Rocky Mountain Bell Telephone Company in about thirty days. The company's men have been rushing work there recently, building additional toll circuits to Wallace and placing cable construction to supplant open wires. Coeur d'Alene City has seen much active work by the company, including new cable construction and the removal of poles from the principal streets.

Helena, Mont.—Work has been started on the first telephone line in the Helena Forest Reserve. It will be about twenty-five miles long, and will extend from a rangers' camp on Dry Cottonwood, to Bernice. A mining company and a lumber concern have agreed to put up the poles for the free use of the line, and the Government will string the wires and install the instruments. The idea is to finish the line this fall. Forestry Service has also appropriated $2,828 for a line from Gardner to Cooke. E. C. Russell, supervisor.

Atlanta, Ida.—Supervisor E. Grandjean, of the Sawtooth National Forest of Idaho, has been authorized to expend $1,550 on the construction of a telephone line from Atlanta to Twin Springs. This improvement will afford quick communication between several important points in the Sawtooth Forest, and will give much better fire protection. The line will be fifty miles in length, and will connect four of the ranger stations which are now being built from the permanent improvement fund, giving the forest rangers direct communication with each other, and with the supervisor's office. This work will be done in cooperation with the mining company of Atlanta, the company to supply labor for the construction of one-half of the line in exchange for use of the wires. The other half of the labor will be furnished by the Forest Service, which will also supply the material for the entire fifty miles.

INCORPORATIONS.

Bodie, Cal.—The Green Creek Electric & Water Power Company has been incorporated to furnish light and power to Bodie, Masonic, Bridgeport and Aurora.

Los Angeles.—The Chino Domestic Water Company has been incorporated with a capital stock of $500,000 by Ralph Bandini of Pasadena, J. P. Loeb and M. S. White of Los Angeles.

Bakersfield, Cal.—With a capital stock of $100,000 the Thirty-six Oil Company has been incorporated by Mary J. Thomas, Ella Goe, C. L. Hovey, A. E. Bolton and W. B. Beaizley.

Bakersfield, Cal.—The Washington-Kern Oil Company has been incorporated with a capital stock of $100,000 by C. A. Hively, C. A. Bennitt, W. W. Krotzen, R. S. Loughead, and C. L. Claflin.

Los Angeles.—The Valencia Land & Water Company has been incorporated by Q. J. Rowley, W. T. Kendrick, A. L. Darby, Frank Burke and A. L. Ball. The capital stock is $30,000.

Hollister, Cal.—Articles of incorporation have been filed by the Lonoak Oil Company with a capital stock of $200,000 by Wm. Vanderhurst, H. E. Abbott, T. J. Field, R. R. Allen, J. K. Alexander and others, all of Monterey. The place of business is Salinas.

Los Angeles.—The Bradley Land & Water Company has been incorporated with a capital stock of $50,000 by Washington Hadley, A. H. Bradley, G. W. Scott, H. S. Hubbard and Matilda S. Johnson.

Rialto, Cal.—With L. E. Newcomb, A. B. Paddock, A. H. Morgan, J. C. Boyd, F. Slade, W. P. and J. F. Martin as directors the Rialto Light & Power Company ahs been incorporated with a capital stock of $10,000.

FINANCIAL.

San Francisco.—The Geary Street Railroad Company has turned over $515 to the city, this sum representing ten per cent of the gross receipts of the line for the last ten days of September.

Petaluma.—At the regular meeting of the Petaluma Power & Water Company, it was voted to increase the bonded indebtedness of the company by $100,000. The decision was reached after a long discussion on the growing needs of the city. Every cent realized will be utilized in improving the local water system. Steel pipes will connect the several creeks in the mountains, the new reservoir will be completed and other needed work done. The plan has been under consideration by President Hill and Superintendent Heseker for some time and their ideas are now backed by the votes of the company.

San Francisco.—The Supreme Court has upheld the decision of the lower court in the suit brought by the New England and Coalinga Oil Company against M. S. Congdon to recover possession of certain oil-bearing land in Fresno County. The New England and Coalinga Oil Company located a quarter section in Fresno County, and with the exception of building a shed thereon failed to improve the property. The defendant Congdon afterward claimed the land on the ground, that certain improvements had been made by him and that he was a bona fide holder. The company brought suit to have the defendant ejected on the ground of prior title. The court, however, decided that Congdon was the bona fide holder of the ground.

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